

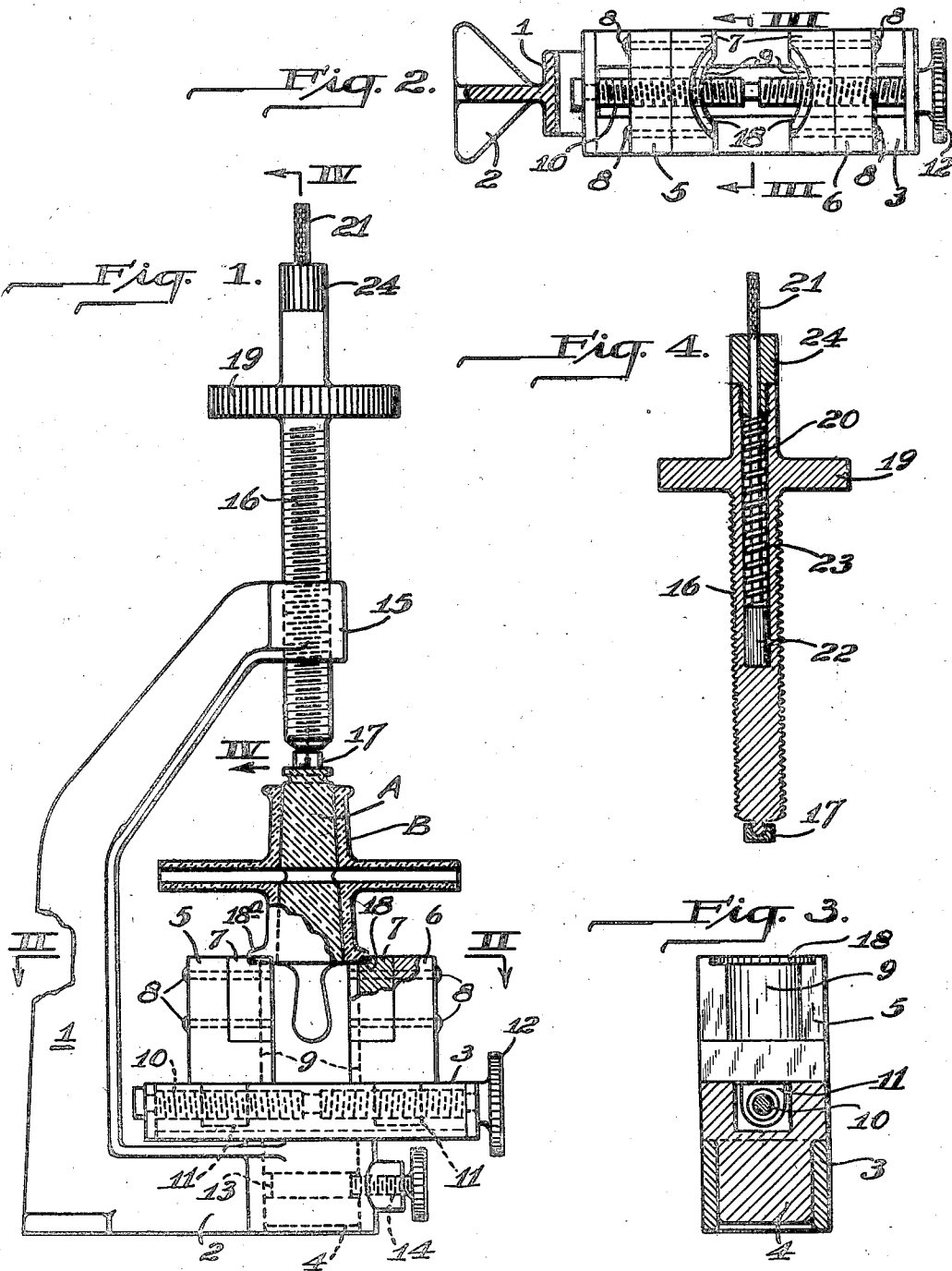
April 30, 1935.

E. H. FISHER

1,999,537

REMOVAL OF FROZEN PLUGS FROM STOP COCKS

Filed Oct. 9, 1933



WITNESSES

A. Wallace.
J. B. Flick

INVENTOR

Edwin H. Fisher
by Brown, Cutchlow & Flick
his attorneys.

UNITED STATES PATENT OFFICE

1,999,537

REMOVAL OF FROZEN PLUGS FROM
STOP-COCKS

Edwin H. Fisher, Pittsburgh, Pa., assignor to
Fisher Scientific Company, Pittsburgh, Pa., a
corporation of Pennsylvania

Application October 9, 1933, Serial No. 692,721

4 Claims. (Cl. 81—3)

This invention relates to the removal of frozen plugs from glass stop-cocks, such as those used with laboratory apparatus.

Workers with laboratory apparatus recognize that one of the difficulties met with most commonly is the so-called freezing of glass stop-cock plugs, i. e., the adherence of the plug to the barrel so firmly as to resist all manual attempts to turn or loosen the plug. Such freezing of the plugs constitutes a source of annoyance and expense, either because the plugs are useless, or because no means has been available for quickly and safely loosening the plugs to adapt the stop-cock for further use. Various laboratory make-shifts are applied to loosen the plugs, but they are generally inefficient against solidly frozen plugs, they are unreliable, and commonly they result in breaking some component part of the stop-cock.

Devices for this purpose have been suggested, but the art recognizes that they have been subject to various disadvantages, and they have not been especially efficacious. One serious difficulty commonly encountered in the use of such devices has been that in the attempt to loosen the frozen plug the stop-cock may be easily broken.

These devices work on the general principle of applying static pressure longitudinally of the plug, to expel it in the natural direction from the barrel. One of the more recent of these embodies jaws of fixed aperture for supporting the stop-cock barrel, and means for applying continuously increasing pressure to the free end of the plug, the idea being that such a static pressure will disrupt the bond responsible for freezing. Such devices have been found to be incapable of loosening frozen plugs in many instances, and to possess other disadvantages. For instance, the fixed aperture jaw construction has been such that the jaws split easily when the pressure is applied to the plug. The fixed jaw aperture has also constituted a drawback, because the jaw device must be changed each time a stop-cock of different size is used with the device. Moreover, with a given size of stop-cock there commonly are variations in its dimensions, so that jaws of a given size may be unsuited for the particular stop-cock.

In consequence of these and other factors, prior apparatus of this type has been inefficient, and the tendency of laboratory workers has been to disregard such devices as have been available, so that if the plug could not be loosened readily by makeshift manual operations it has been discarded as useless.

It is among the objects of this invention to provide an improved and novel method of and apparatus for removing frozen plugs from glass stop-cocks, whereby the plugs may be removed readily and simply, and with less danger of breakage than heretofore, and which are susceptible of satisfactory use more frequently and with more severely frozen stop-cocks than has been the case with the devices known heretofore in the art.

The invention will be described in connection with the accompanying drawing, which for purposes of description and illustration only illustrates its preferred embodiment, and in which Fig. 1 is a side elevation, partly in section, of an apparatus embodying the invention; Fig. 2 a horizontal section taken on line II—II, Fig. 1; Fig. 3 a vertical section through the jaw mechanism, taken on line III—III, Fig. 2; and Fig. 4 a longitudinal section through the pressure-applying member, taken on line IV—IV, Fig. 1.

All prior devices for removing frozen plugs from glass stop-cocks with which I am familiar have operated on the principle that the glass plug should be loosened by the application of static pressure, preferably increasing in magnitude until the plug is expelled. I have discovered, and it is upon this that my invention is predicated in part, that much more satisfactory results are obtained by subjecting the plug repeatedly to rapid impact blows of small magnitude applied in the direction of the longitudinal axis, and that the most satisfactory results are obtained by supporting the glass stop-cock barrel so that the plug is free to move longitudinally therein, applying a continuous static pressure of low magnitude to the end of the plug, and while the plug is subjected to the static pressure simultaneously subjecting it to repeated rapidly applied impact blows of low magnitude.

I have found that by the method just described the plugs are removed more easily than by the means heretofore available, and with less danger of breakage of the glass parts, and furthermore that plugs which could not be removed by other means can be readily and safely loosened. The repeated rapid relatively light impacts appear to be much more efficacious in disrupting the bond between the frozen surfaces than the static pressures used heretofore, and especially is this the case where the plug is subjected to a small continuously applied static pressure in conjunction with repeated rapid impact blows. Although I do not confine myself to this theory, it appears probable that impact, or dynamic, pres-

sure is better adapted to disrupt the freezing bond, and especially when combined with a low static pressure which applies a tension to the bond which holds the frozen surfaces but which is incapable of itself breaking the attraction between them, but which permits the cohesive or adhesive bonding forces to be overcome when additionally subjected to the influence of rapid impacts.

The invention also contemplates an apparatus for the practice of the method. Such an apparatus in its simplest embodiment comprises means for supporting the barrel with the plug free to be expelled, and means for applying rapidly-acting impact blows to the free end of the plug. Such blows should be such as to apply a substantial jar to the article, but they should not be such as to subject it to ready shattering, for which reason they are referred to as blows of low magnitude. In the preferred embodiment of the invention the apparatus comprises a frame which carries jaw members adapted to support the stop-cock barrel with the plug free to move outwardly, and which likewise carries a ram movable toward and from the jaws to apply any desired static pressure to the plug longitudinally of its axis of rotation in the direction in which it may be expelled from the barrel. Associated with the ram is means of any desired character for setting up in the ram a dynamic stress which is conveyed to the plug in accordance with the method described. Most suitably the jaw mechanism includes a pair of opposed jaws reciprocable toward and from each other, so that a single set of jaws suffices for stop-cocks of all sizes. Advantageously the jaws are reciprocated by quick-acting mechanism which holds them in fixed position once they have been adjusted.

Having reference now to the drawing, the embodiment shown comprises a frame member 1 having at its lower end an arm, or base, member 2 adapted to carry stop-cock supporting jaw mechanism. In the form shown the jaw mechanism comprises a jaw block 3 carried by a stud 4 mounted rotatably in a suitable bore in base 2, as shown in Fig. 1. A pair of jaw members 5 and 6 are carried movably on top of jaw block 3. The upper and inner surfaces of the jaws most suitably are formed of fiber or the like non-metallic material suited to carry the glass barrel without damage thereto, for example in the form of inserts 7 fastened to the jaws by pins 8. The opposed jaw faces are generally parallel, suitably with arcuate portions 9.

The jaws are reciprocated toward and from each other by quick-acting means, such as a right and left-hand screw 10 rotatably mounted centrally of the jaw block engaging threaded lugs 11, Fig. 1, carried by jaw members 5 and 6. The screw is operable by means of a thumb screw wheel 12. Thus the jaw aperture may be increased or decreased rapidly, and when the aperture has been adjusted it does not change under the pressure to which the jaws are subjected in use.

It is desirable that the jaw mechanism may be locked in any desired angular position, and to this end lug 4 is provided with a peripheral aperture 13 which cooperates with a locking screw 14, of Fig. 1.

Carried by the upper end of frame 1, as by an arm 15 projecting over the base, is a ram member 16 movable by any suitable means toward and from the center of the jaw opening. In the embodiment shown the ram is provided with screw threads cooperating with similar threads

provided in arm 15. The lower end of the ram is provided with a tip 17 for contact with the free end of a glass plug A to be expelled from the glass stop-cock B, to apply the expelling pressures thereto. Prior devices of this nature have commonly embodied a point of rounded nature, and such points may be used in the practice of this invention. Advantageously, however, they are flat, as shown, and are adapted to apply the pressure over a relatively large area of the end of the plug, as seen in Fig. 1. In the preferred embodiment the tip is rotatably mounted on a ball bearing, as indicated in Fig. 4.

The stop-cock B whose plug A is to be removed is positioned with the barrel supported on jaws 5 and 6 and with the handle portion of the plug projecting between them, so that the plug is free to move longitudinally of the barrel when expelled. The upper surfaces of jaw faces 7 preferably are recessed slightly, as at 18, to provide a seat for the shoulder 18a which extends around the end of the barrel. These recesses should be somewhat less than the thickness of shoulder, or flange, 18a so that when the jaws are closed to the proper size the barrel will not be crushed, the shallowness of the seat causing it to be expelled upwardly if further closing places undue pressure on the flange. With the stop-cock positioned on the jaw, as shown, ram 16 is lowered, by turning hand wheel 19, or by twirling the ram between the fingers, to bring tip 17 into contact with the end of the plug and apply longitudinal static pressure thereto, such pressure being insufficient to break the stop-cock, and insufficient to expel the plug.

In accordance with the invention the plug is subjected to repeated rapid dynamic stresses, through impacts, of low magnitude. Most suitably the ram is provided with means for accomplishing this, and while various means are available it is preferred to use the construction shown in the drawing, especially Fig. 4. As there shown, ram member 16 is provided with a longitudinal central bore 20 in which there is mounted a rod 21 carrying a hammer 22 at its lower end. A coil spring 23 is biased between the upper end of hammer 22 and the lower end of a top closure plug 24 which makes screw-threaded engagement with the upper end of the ram. In order to apply impact blows, rod 21 is drawn upwardly by means of its projecting end, against the tension of spring 23, and when it has been drawn to its upper limit it is released, whereupon the spring drives it downwardly to apply a sharp blow to the base of the ram, the dynamic force of the blow being conveyed through tip 17 to the stop-cock.

Static pressure having been applied to the end of the stop-cock, its removal is effected by repeatedly applying impact blows in the manner just described. This will satisfactorily loosen frozen plugs which can not be loosened by other means.

Because the forces used, both static and dynamic, are of low magnitude, the danger of breaking the glass stop-cock parts is minimized, as compared with prior practice, especially since smaller static pressures may be used, and because relatively low dynamic forces are necessary, the combination of the two in accordance with this invention is more effective than the means heretofore used for this purpose.

In practice it may commonly be observed that the plug begins to loosen at its upper end, and that the loosening proceeds progressively toward

the handle end of the plug. This may be observed by a difference in the color of the ground glass joint between the plug and barrel. In case such progressive loosening of the plug decreases the static pressure to a point at which the operation becomes less effective, it is necessary only to turn ram 16 to maintain a continuously applied static pressure, the operation continuing as before.

Thus the invention provides a method of and apparatus for efficiently and readily removing frozen plugs from glass stop-cocks, and with relatively little danger of breaking them. It is applicable to stop-cocks of all sizes and forms, irrespective of the angular position of the plug when frozen, and a simple jaw mechanism suffices for all of these.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention, and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An apparatus for removing a frozen plug from a glass stop-cock, comprising a frame member, an arm projecting from an end of said member, stop-cock-supporting jaw mechanism rotatably carried by said arm including a pair of jaws reciprocable toward and from each other, and right-and-left hand thread means associated with the jaws for reciprocating them toward and from each other, a ram member carried by the frame at the end opposite said arm, means cooperating between the ram and frame for moving the ram toward and from said jaws, for applying static pressure to the end of a plug in a stop-cock supported by the jaws, and means associated with the ram adapted to apply impact therethrough to the plug.

2. An apparatus for removing a frozen plug from a glass stop-cock, comprising a frame member, an arm projecting from an end of said member, stop-cock-supporting jaw mechanism carried by said arm including a pair of jaws reciprocable toward and from each other, and means for reciprocating the jaws, a ram member carried by the frame at the end opposite said arm, means cooperating between the frame and

ram for moving the ram toward and from said jaws, for applying static pressure to the end of a plug in a stop-cock supported by the jaws, the ram being provided with a longitudinal bore closed at both ends, and means associated with said bore for applying rapid impact stresses to the plug through the ram and including a rod having a hammer at its lower end and its other end extending reciprocably through the top closure of the bore top, and a coiled spring in the bore biased between the hammer and top closure.

3. An apparatus for removing a frozen plug from a glass stop-cock, comprising a frame member, an arm projecting from an end of said member, stop-cock-supporting jaw mechanism rotatably carried by said arm including a pair of jaws reciprocable toward and from each other, a right-and-left hand thread member having its threads associated with said jaws for reciprocating them toward and from each other, a ram member having screw threads cooperating with threads provided in the frame at the end opposite said arm for moving the ram toward and from said jaws, a pressure-applying tip on the lower end of the ram of such size as to apply the pressure to a large area of the plug, and means associated with the ram adapted to apply impact therethrough, to the plug including a reciprocable hammer mounted in a longitudinal bore in the ram, means closing said bore at both ends, a rod connected to said hammer extending through the top of the bore, and a coiled spring in the bore biased between the hammer and end of the bore.

4. An apparatus for removing a frozen plug from a glass stop-cock, comprising a frame member, stop-cock supporting jaw mechanism carried by said frame member and including a pair of jaws for loosely supporting the stop-cock barrel with the plug disposed for free expulsion, the upper faces of said jaws being recessed to a depth less than the thickness of the flange of the stop-cock barrel, means acting only on said plug for applying longitudinally-acting static pressure to the free end of the plug of a stop-cock supported by said jaws, and means adapted simultaneously to apply impact blows of low magnitude to the plug in the direction of said static pressure.

EDWIN H. FISHER.