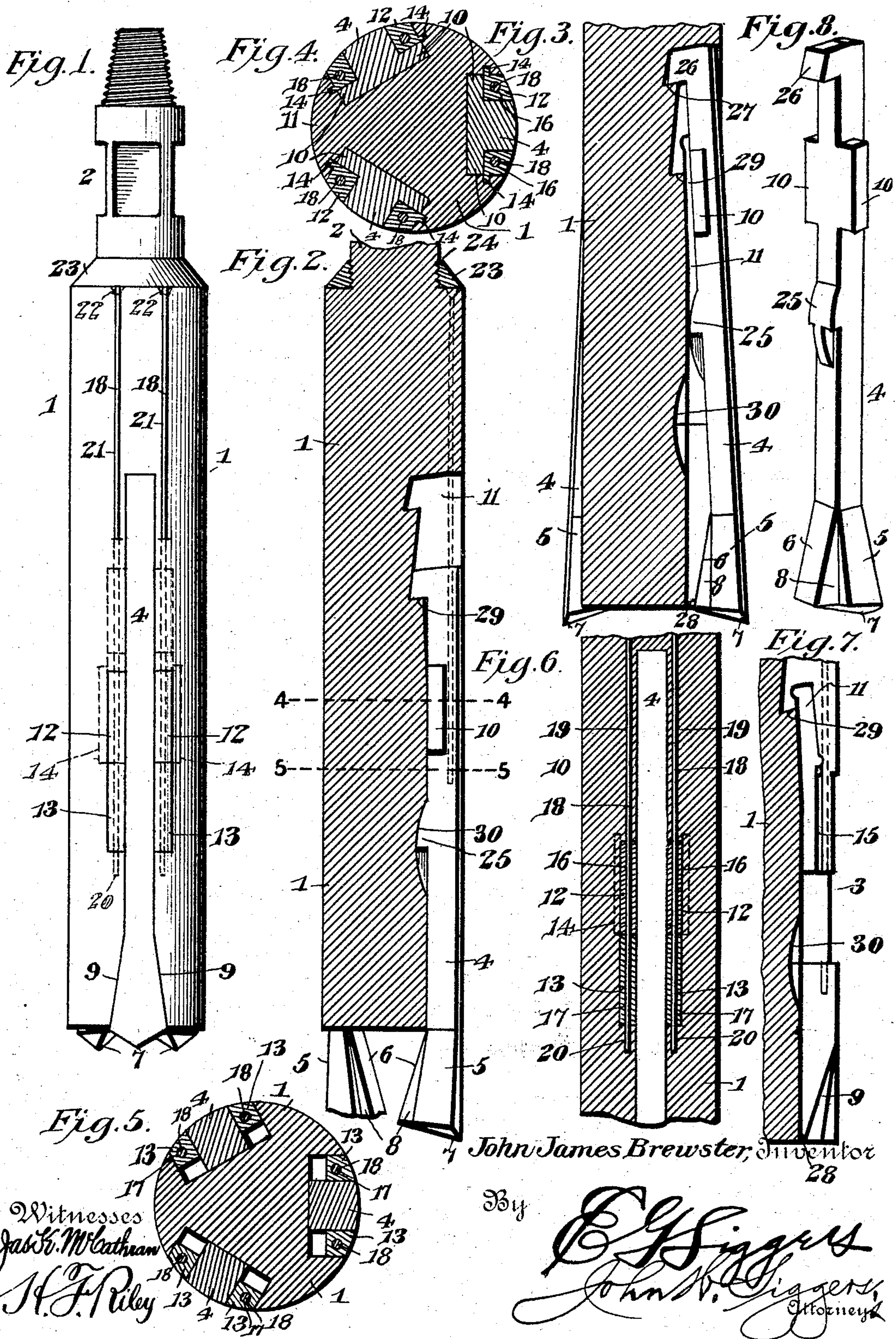


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J. J. BREWSTER.
UNDERREAMER FOR WELLS.
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UNITED STATES PATENT OFFICE.

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UNDERREAMER FOR WELLS.

SPECIFICATION forming part of Letters Patent No. 782,320, dated February 14, 1905.

Application filed September 15, 1904. Serial No. 224,539.

To all whom it may concern:

Be it known that I, JOHN JAMES BREWSTER, a British subject, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Underreamer for Wells, of which the following is a specification.

The invention relates to improvements in underreamers for wells.

10 The object of the present invention is to improve the construction of underreamers for wells and to provide a simple, inexpensive, and efficient tool of this character adapted to be readily passed through a well-casing to introduce it into the bottom of a well and capable of reaming or enlarging the bottom and of being readily withdrawn through the well-casing after the reaming operation has been completed.

20 A further object of the invention is to provide a tool of this character capable of passing through a well-casing in a contracted condition and of being readily expanded and arranged for operation after passing through the said casing and of being conveniently returned to its contracted or inoperative condition to enable it to be withdrawn.

30 Another object of the invention is to provide a bottom-reamer having a plurality of movable bits or cutters which will produce a round hole and which will be so constructed that pebbles and small stones will not interfere with their operation when withdrawing the tool.

35 With these and other objects in view the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion, size, and minor details of construction within the scope of the claims may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

45 In the drawings, Figure 1 is an elevation of an underreamer constructed in accordance with this invention and shown arranged for operation. Fig. 2 is a longitudinal sectional

view of the same, the bits or cutters being extended longitudinally for contracting the diameter of the tool. Fig. 3 is a longitudinal sectional view of a portion of the tool, the parts being arranged as shown in Fig. 1. Fig. 4 is a transverse sectional view on the line 4-4 of Fig. 2. Fig. 5 is a similar view on the line 5-5 of Fig. 2. Fig. 6 is a longitudinal sectional view taken at right angles to Fig. 2 and illustrating the arrangement of the upper and lower blocks and the rods for retaining the same in the ways of the body. Fig. 7 is a detail view illustrating the construction of the ways of the body. Fig. 8 is a detail perspective view of one of the bits or cutters.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 designates the body of the tool, which is circular in cross-section and which is provided at its upper end with a reduced portion or shank 2, adapted to be secured to the shaft or other operating mechanism, and any means may be employed for effecting such connection. The body of the tool is provided with a plurality of longitudinal ways 3, consisting of grooves or channels and receiving bits or cutters 4, having inwardly-tapered lower portions 5, presenting angularly-disposed inclined faces 6 and forming wedges adapted, as hereinafter explained, to force the cutting portions of the bits or cutters outward, whereby the bits or cutters are expanded to the position illustrated in Figs. 1 and 3 of the drawings. The upwardly-tapered lower portion 5 is also provided with inclined side faces, as clearly illustrated in Figs. 1 and 8 of the drawings, and the lower end 7 of the bit or cutter is oppositely beveled to provide a transverse cutting edge which inclines upwardly and inwardly, the lower end faces of the bits or cutters being beveled or cut away, as shown in Fig. 3, to produce outer cutting-points. The cutting portions, which taper to a point at the outer faces of the bits or cutters, are approximately triangular, as shown. The tapered lower portion of the bit or cutter is also recessed or cut away at the back at opposite sides of the inner inclined faces 6, as clearly shown at 8 in Fig. 8 of the drawings. The lower end of the

body of the bit is provided with a flat face, and the cutting portions of the bits or cutters extend downward slightly beyond the plane of the lower face of the body, as shown in Fig. 3, and the reamer is adapted to produce a round hole, and there is no liability of small stones, pebbles, or other accumulation interfering with the operation of the bits or cutters when withdrawing the tool, as hereinafter explained. The particular construction of the lower ends of the bits or cutters provides spaces or passages for permitting water to flow freely around the tool. The lower portions 9 of the ways or channels 3 of the body are tapered to receive the tapered lower portions of the bits or cutters, as clearly shown in Fig. 1 of the drawings.

The bits or cutters 4 are provided with integral shanks or bars rectangular in cross-section, as clearly shown in Fig. 8 of the drawings, and provided with opposite laterally-extending flanges 10, which slide in longitudinal grooves 11, formed in the opposite walls of the ways or channels and permitting the bits or cutters to move longitudinally a limited distance to enable the said cutters to assume either the position illustrated in Fig. 1 or that shown in Fig. 2. The upper portions of the longitudinal grooves 11 are formed by grooving the walls of the channels or ways, and the lower portions of the grooves are formed by upper and lower blocks 12 and 13, arranged in pairs and set in recesses, the inner faces of the blocks being flush with the outer walls of the upper portions of the grooves. The lower blocks, which are of a length slightly in excess of the length of the flanges 10, when removed provide entrances to the longitudinal grooves 11 and enable the bits or cutters to be readily introduced into the channels or ways and removed therefrom. When it is desired to remove a bit or cutter, the lower blocks are detached, as hereinafter explained, and the bit or cutter is drawn downward until the flanges are brought opposite the entrances formed by removing the lower blocks. The bit or cutter may then be readily removed from the body of the tool. The upper blocks are interlocked with the walls of the channels or ways by means of longitudinal tongues 14, formed integral with the blocks 12 and fitting in corresponding grooves of the walls of the recesses 15. The upper and lower blocks are provided with registering longitudinal bores 16 and 17 for the reception of longitudinal rods 18, which are arranged in bores 19 and 20, located above and below the blocks, as clearly shown in Fig. 6 of the drawings. The body of the tool is provided above the upper portions 19 of the bores with grooves or channels 21 for the reception of the attachment-rods, which have heads 22 at their upper ends. The heads 22 are engaged by an internally-threaded collar 23, arranged on a threaded portion 24 of the shank 2 of the tool.

Any suitable means may be provided for removing the threaded collar, and when the same is detached the rods may be readily withdrawn sufficiently to permit the removal of the lower rods.

The bits or cutters are provided at their inner faces with intermediate rounded portions or enlargements 25, fitting against the inner or rear walls of the ways or channels when the parts are arranged as shown in Figs. 1 and 3 of the drawings and fulcruming the bits or cutters for enabling the lugs 26 to be readily disengaged from upper shoulders 27 when it is desired to arrange the bits or cutters for removing the tool. When the bits or cutters are arranged for operation, there is a space between the lower ends of the cutters and the inner walls of the channels or ways 3, as shown at 28 in Fig. 3 of the drawings, whereby the lower arm or portion lying below the enlargement 25 is adapted to be swung inward to disengage the said lug 26 from the shoulder 27. This disengagement is effected by drawing the tool upward until the lower end of the casing strikes the outer faces of the lower portions of the bits or cutters, which will be swung inward by such contact. The lug 26, which extends inward from the upper end of the bit or cutter, as clearly shown in Figs. 1, 3, and 8, forms a hook-shaped portion and is slightly inclined when the tool is in condition for operation. The inner or rear walls of the channels or ways are recessed at the upper portions to provide a shoulder 27 and a shoulder 29, which is arranged slightly below the shoulder 27 and which receives the lug 26 when the bits or cutters are extended longitudinally to contract the tool circumferentially. The shoulder 29 receives the lug 26 when the bits or cutters are extended longitudinally and supports the tool, as clearly shown in Fig. 2. When the bit or cutter is supported by the shoulder 29, the laterally-extending flanges do not extend to the lower ends of the lower blocks. The body of the tool is provided at its lower portion with curved recesses 30, formed in the inner or rear walls of the longitudinal ways or channels to receive the rounded enlargements 25 when the tool is contracted. The inner or rear walls of the ways or channels 3 and the upper portions of the opposite grooves 11 are inclined and enlarged to permit the necessary movement of the flanges 10 when the bits or cutters are moved upward in the ways or channels for engaging the lug 26 with the shoulder 27 and also when the upper portions of the bits or cutters are moved outward to disengage the lugs 26 from the shoulders 27.

The tool is introduced into a well-casing with the bits or cutters arranged as shown in Fig. 2, and when the said bits or cutters contact with the bottom of the well the weight of the tool will cause the body portion to con-

tinue its downward movement until the upper ends of the bits or cutters engage the upper end walls of the ways or channels. This movement of the body relative to the bits or cutters will cause the lower cutting portions of the latter to move outwardly by reason of the inclined inner faces 6 engaging the lower end of the body. When the body has reached the limit of its downward movement, a slight lifting of the cable, to which the tool is attached, will cause the lugs to drop inwardly on the seats formed by the shoulders 26. The shoulders 26 incline downwardly and inwardly, and the upper end walls of the ways or channels are also similarly inclined. The downward pressure on the tool will hold the bits or cutters firmly in position for boring, and as soon as the bits or cutters are relieved of such pressure they will be in condition for operation by the well-casing.

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

1. A tool of the class described, comprising a body, and a bit or cutter movably mounted on the body in a longitudinal direction and arranged to extend beyond the lower end of the body, whereby the weight of the latter will move the same upward on it when the tool comes in contact with the bottom of a well, said bit or cutter having an oppositely-beveled lower end and tapered upwardly above the same at both the sides and back to present inclined inner and side faces

2. A tool of the class described, comprising a body, a bit or cutter movably mounted on the body in a longitudinal direction and arranged to extend beyond the lower end of the body, whereby the weight of the latter will move the same inward on it when the tool comes in contact with the bottom of a well, means for automatically moving the bit or cutter outward simultaneously with the inward movement of the same on the body, and a fulcrum located between the ends of the bit or cutter, the said bit or cutter having its portion below the fulcrum spaced from the body and adapted to move inwardly.

3. A tool of the class described, comprising a body having a way or channel and provided at the upper portion thereof with a seat, and a longitudinally-movable bit or cutter provided at its upper portion with a lug for engaging the seat and having a lower tapered portion, said bit or cutter being provided with an intermediate fulcrum.

4. A tool of the class described, comprising a body having a way or channel and provided

at the upper portion thereof with a seat and having a recess at an intermediate point, and a longitudinally-movable bit or cutter provided at its upper portion with a lug for engaging the seat and having a lower tapered portion, said bit or cutter being provided with an intermediate fulcrum, said intermediate fulcrum being adapted to fit in the recess of the body when the tool is contracted.

5. A tool of the class described, comprising a body having a way and provided with recesses, a bit or cutter slidable in the way and provided with laterally-extending flanges, blocks mounted on the body in the recesses thereof and forming entrances to the said way when removed, and means for detachably securing the blocks in position.

6. A tool of the class described, comprising a body having a way and provided with recesses, a bit or cutter slidable in the way and provided with projecting flanges, upper and lower blocks arranged in the recesses, the upper blocks being interlocked with the body, and the lower blocks being removable to provide entrances to the way, and rods passing through the blocks and engaging the body above and below the same.

7. A tool of the class described, comprising a body having a way and provided with recesses, a bit or cutter slidable in the way and provided with projecting flanges, upper and lower blocks arranged in the recesses, the upper blocks being interlocked with the body, and the lower blocks being removable to provide entrances to the way, rods passing through the blocks and engaging the body above and below the same, and a removable collar mounted on the body and engaging the rods.

8. A tool of the class described, comprising a body having a longitudinal way and provided at opposite sides thereof with grooves and having recesses, a slidable bit or cutter having flanges arranged in the grooves, removable blocks mounted on the body in the recesses thereof, rods engaging the bores of the body and the blocks at opposite ends of the latter, said body being also grooved beyond the bores to receive the rods, and the latter being provided with heads, and means for engaging the heads of the rods for retaining the latter in position.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN JAMES BREWSTER.

Witnesses:

A. K. DAGGETT,

W. E. VON JOHANNSEN.