

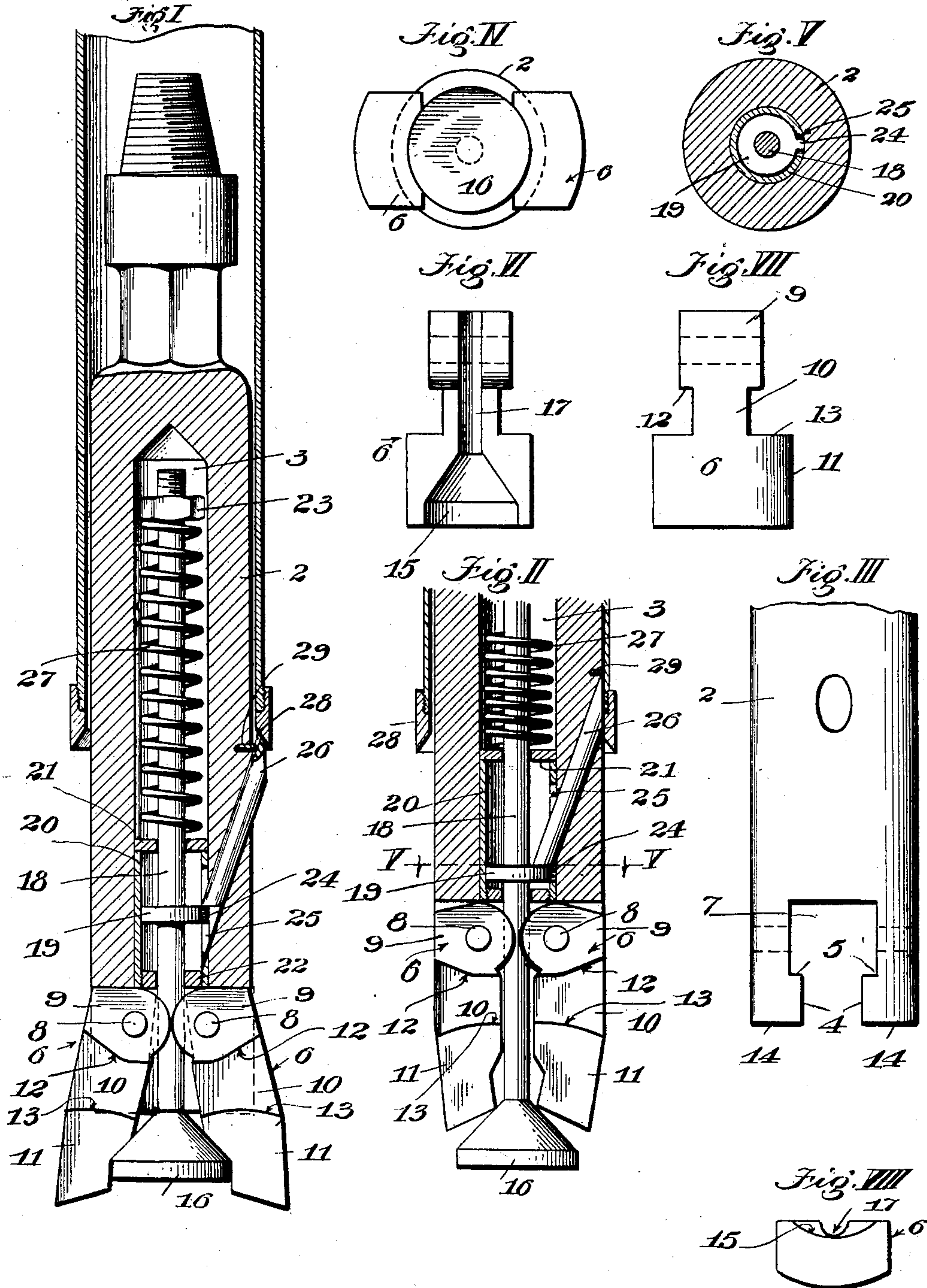
No. 762,458.

PATENTED JUNE 14, 1904.

A. WILLARD.  
UNDERREAMER.

APPLICATION FILED MAY 5, 1903.

NO MODEL.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## UNDERREAMER.

SPECIFICATION forming part of Letters Patent No. 762,458, dated June 14, 1904.

Application filed May 5, 1903. Serial No. 155,719. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR WILLARD, a citizen of the United States of America, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Underreamer, of which the following is a specification.

My invention relates to underreamers for reaming out the holes of oil and Artesian wells, &c., larger than the casing to permit the lowering of the casing.

The general object of my invention is to provide an underreamer of exceedingly simple, cheap, and durable construction which shall be composed of few parts of such construction and interrelation as to avoid becoming displaced in the device and getting out of working order.

A further object of the invention is to provide an underreamer of the class in which the reaming-bits are pivoted upon the mandrel-body proper and are expanded by an automatically-operating wedge, the bits being so pivoted in the mandrel that the strain of underreaming is substantially taken off the pivots and borne by the mandrel-body proper.

Other and further objects and ends in view will hereinafter appear from the detail description.

The invention consists in general and specific combinations of parts and constructions, all as hereinafter described, and particularly pointed out in the claims, and will be more readily understood by reference to the accompanying drawings, forming a part of this specification, and in which—

Figure I is a longitudinal sectional view of an underreamer embodying my invention, the same being shown in connection with a section of a well-casing and in position for underreaming. Fig. II is a partial longitudinal sectional view showing the bits contracted for passage through the well-casing. Fig. III is a partial side elevation of the mandrel, the reaming-bits being removed. Fig. IV is a bottom view with the reaming-bits in expanded position. Fig. V is a plan view taken on the line V V of Fig. II. Figs. VI and VII are side elevations of the reaming-bits which

I employ. Fig. VIII is a bottom view of one of the reaming-bits.

As shown in the drawings, 2 represents the mandrel, which is provided with a central chamber 3, which extends longitudinally thereof, as shown. The lower end of the mandrel is shown best in Fig. III. This slotted portion is provided with inward projections 4 at the end of the mandrel, whereby abutments 5 are formed for the purpose hereinafter set forth. The reaming-bits 6 are pivoted within the chamber 7 thus formed above the abutments 5 by pins 8, which pass through eyes or holes in the bits and have bearings on the opposite walls of the mandrel, as indicated by dotted lines in Fig. III.

As shown in Figs. VI and VII the reaming-bits are composed of the head portion 9, the intermediate portion 10, and the blade portion 11. The intermediate portion is cut away to provide the shoulders 12, which, as shown best in Figs. I and II, have the two inclinations shown.

13 represents shoulders on the upper ends of the blade portions 11 adapted to contact or abut against the ends 14 of the mandrel. The inner sides of the bits are provided with sockets or seats 15, adapted to receive the spreader or wedge 16 when the bits are expanded, and the grooves 17 in which the stem or rod 18 rests. The stem or rod 18 is adapted to work in the chamber 3 and is provided with a shoulder or flange 19, preferably formed integral therewith.

20 represents a barrel or cylinder about the rod 18 and extending up for a portion of the length thereof. This barrel or cylinder is provided with a top plate 21 and a bottom plate 22. The top plate 21 may be formed integral with the barrel or loose or may be in the form of a loose collar or may be detachably secured on the top of the barrel, as desired. The bottom plate 22 is preferably threaded onto the bottom of the barrel. Above the barrel 20 a coiled spring 27 is interposed about the rod 18 and bears against a head 23 on the rod. This head is preferably in the form of a nut, engaging a thread on the end of the rod, and by turning the nut



down on the rod any desired tension of the spring can be secured. The wedge or spreader 16 is preferably formed integral with the rod 18 and adapted when in the position of Fig. I to rest on the seats 15 of the bits.

The barrel 20 is provided with a longitudinal slot and the collar or flange 19 provided with a projection 24, extending through this slot and adapted to work therein. The mandrel 2 is provided with a way 25, which extends inward from the outer surface at an acute angle, as shown, and in this way is provided a pin 26, which bears against the projection 24 and collar or flange 19 and extends when the underreamer is passing through the casing into contact with the inner surface of the casing, causing the rod 18 to be forced down, throwing the spreader or wedge 16 out of the seats 15 of the bits, so that the bits drop of their own weight into their contracted positions. The rod 26 thus forms automatic means whereby upon coming in contact with the casing the spreader or wedge is forced down against the tension of the spring 27. Toward the upper end of the pin 26 a slot 28 is provided, and a pin 29, extended out from the mandrel, is adapted to operate in this slot and prevents the pin 26 from being thrown out of the way 25 when the spring 27 forces the rod 18 up, the operating-pin 26 having passed out from the casing.

The mandrel 2 may be connected to the "sub" in the ordinary or any preferred manner.

It is seen that by making the transverse slots of greater width than the downward or vertical slots abutments 5 are provided upon which the shoulders 12 of the bits contact or bear. The pins 8 are thus relieved from the strain of the weight of the bits when the underreamer is being lowered into the casing or pulled up out therefrom.

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

1. In an underreamer, in combination, a hollow mandrel having a slotted portion at its lower end, reaming-bits pivoted to said mandrel within said slotted portion, said bits provided with shoulders adapted, when in expanded position, to abut against the end of said slotted portion and extending through said slotted portion and expanding laterally therethrough, automatic means carried within said mandrel and adapted to normally hold said bits in expanded position, and means adapted to contact with the casing and automatically disengage said expanding means and permit said bits to contract.

2. In an underreamer, in combination, a hollow mandrel, the lower end having a downwardly and transversely slotted portion, said transverse slot being of greater width than the downward or vertical slot, reaming-bits pivoted to said mandrel and extending through said slots, said reaming-bits provided with

shoulders adapted to contact with the abutments or shoulders formed by the walls of said slots, said bits provided with shoulders adapted, when said bits are expanded, to abut against the slotted end of said portion, automatic means carried within said mandrel adapted to normally hold said bits in expanded position, and means adapted to contact with the casing and automatically disengage said expanding means and permit said bits to contract.

3. An underreamer, comprising in combination, a mandrel provided with a central bore and having a transversely-slotted lower portion, having a vertical slot of less width communicating from its lower end into said transverse slot, whereby shoulders are provided by the walls of said slot, reaming-bits pivoted to said mandrel within said transverse slot, said reaming-bits provided with portions adapted to bear upon said shoulders and with shoulders adapted, when said bits are expanded, to abut against the end of said mandrel, and means for expanding and contracting said bits.

4. An underreamer, comprising in combination, a mandrel provided with a central bore and having a transversely-slotted lower portion having a vertical slot extending inward from the end and communicating into said transverse slot, reaming-bits pivotally mounted on said mandrel within said transverse slot and provided with shoulders adapted when in position for underreaming to abut against the end of the mandrel, and means for expanding and contracting the bits.

5. An underreamer, comprising in combination, a mandrel provided with a central bore, reaming-bits pivotally mounted in the lower end of said mandrel, a rod slidably mounted in said central bore and provided with means for expanding said bits, said rod provided with a head or nut at its upper end, a barrel or cylinder about said rod and fixed in said central bore, a spring interposed about said rod and bearing against the top of said barrel and against said head or nut, and means extending through said mandrel and operating within said barrel below the top thereof and adapted to operate against said rod and adapted upon contact with the casing to force said rod against the tension of said spring to permit said bits to contract.

6. An underreamer, comprising in combination, a mandrel provided with a central bore, reaming-bits pivotally mounted in the lower end of said mandrel, a rod slidably mounted in said central bore and provided with means for expanding said bits and with a head or nut on its upper end, a barrel or cylinder about said rod and fixed in said central bore, said barrel provided with a longitudinal slot, a spring interposed about said rod and bearing upon the top of said barrel and against said head or nut on said rod, said mandrel provided with an inclined way communicating into said central bore, and an operating-pin



mounted in said way and operating upon said rod and adapted to contact with the casing to force said rod against the tension of said spring and permit the bits to contract.

5 7. An underreamer, comprising in combination, a mandrel provided with a central bore, reaming-bits pivotally mounted in the lower  
10 end of said mandrel, a rod slidably mounted in said central bore and provided with means for expanding said bits and with a head or  
15 nut on its upper end, a barrel or cylinder about said rod and fixed in said central bore, said barrel provided with a longitudinal slot, a spring interposed about said rod and bearing  
20 upon the top of said barrel and against a head or nut on said rod, said mandrel provided with an inclined way or perforation, an operating-pin mounted in said way and bearing against a portion of said rod and adapted  
25 to contact with the casing to force said rod against the tension of said spring to permit the bits to contract, and means for preventing the tension of said spring throwing said operating-pin out from said way when said  
bits are expanded.

8. An underreamer, comprising in combination, a mandrel provided with a central bore, reaming-bits pivotally mounted in the lower end of said mandrel, a rod slidably mounted

in said central bore and provided with means 30  
for spreading said bits and with a head or nut on its upper end, a barrel or cylinder surrounding a portion of said rod, said rod provided with a flange or shoulder within said barrel, said barrel provided with a longitudinal 35  
slot, said flange or shoulder projecting into said slot, a spring interposed about said rod above said barrel and bearing upon the upper end or head thereof and operating  
40 against said head or nut upon said rod, said mandrel provided with a perforation or way, an operating-pin in said way or perforation adapted to bear against said flange or shoulder and to contact with the casing to force  
45 said rod against the tension of said spring to permit the bits to contract, and means for preventing said spring throwing said operating-pin out from said perforation or way when the bits are expanded.

In witness whereof I have hereunto set my 50  
hand, this 29th day of April, A. D. 1903, in Los Angeles, in the county of Los Angeles and State of California.

ARTHUR WILLARD.

In presence of—

FREDERICK S. LYON,  
GEORGE T. HACKLEY.