March 25, 1941. H. R. CRANE 2,236,468

BORE BORER

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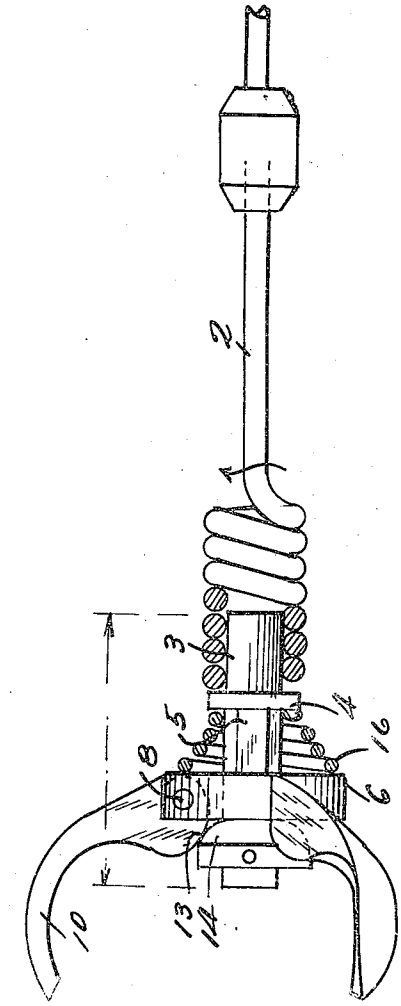


Fig. 2.

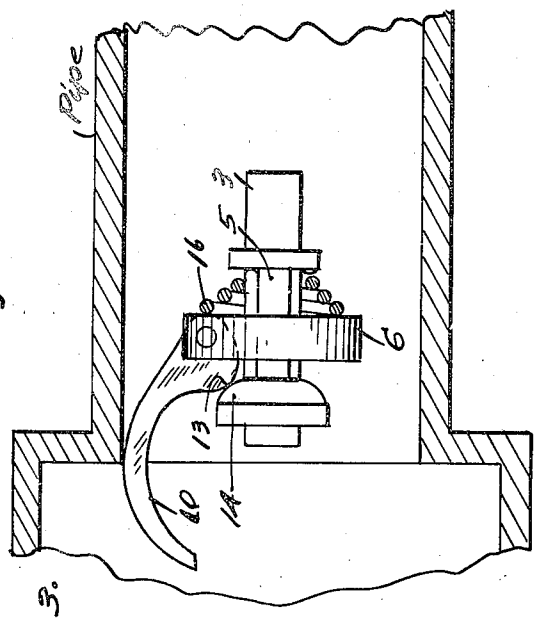


Fig. 3.

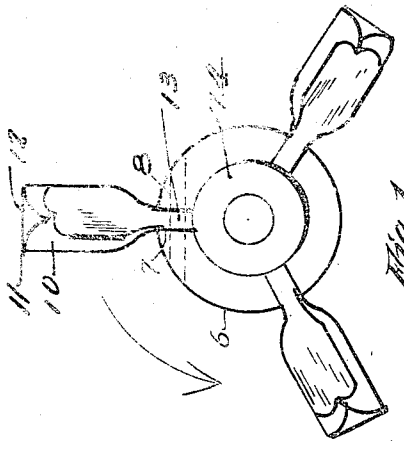


Fig. 1.

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BORE BORER

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6 Claims. (Cl. 15—104.30)

This invention is a pipe bore boring or cleaning or scraping tool head. It is more particularly an expansive-bladed or cutter type head in distinction from screw-feature or beater-element boring and cleaning heads.

It is an object of the invention to provide a boring head wherein a set of radially swinging blades is bodily actuated so that all of the blades are concurrently forced to outer, effective position with an equal degree of pressure and in which each of the blades is capable of yielding action under an over-coming resistance.

Further, an object is to provide a head of this type including a set of radial blades in combination with means acting with equal pressure on all of the blades to co-center the head in pipes or other bores in range of a given size head.

An object is to provide a power-rotative head in which blades thereof will automatically center themselves in bores of several sizes within range of maximum diameter and may be axially advanced as the bore is cleaned, and especially an object is to provide means for the concurrent contraction of all of the blades in uniform degree from a given bore diameter to a smaller bore for safe retraction of the head when it can no longer be advanced; "power" as here used being intended to mean forced rotation of the tool by power from any source—hand or motor, in distinction from screw-action borers which will rotate under forced axial motion.

More in detail, an object is to provide a rotative borer including a rotative mandrel and a set of cutting blades which are individually pivotally mounted and slidable means on the mandrel and carrying the blades and including means for automatically thrusting the carrying means with a blade opening effect, and having means against which any blade may act with a tendency to concurrently contract and reverse the motion of the carrying means.

An additional object is to provide a tool of this type in which, while the several cutting blades are individually yieldable as when singly arrested by an obstacle on reverse pull of the tool, the device is made simple and inexpensive by reason of the provision of but a single master spring which out-thrusts all of the blades and yet is re-acted on compressively by any one of the blades, and by all concurrently, as when retracting into a smaller bore from a larger one.

Therefore, it is an object to provide a bore borer of highly practical form, which is substantially built, has a considerable work-size range, is light in weight in view of the nature of its work, is low in selling price and operational costs and upkeep, and is of few and simple parts, and whose blades, while yieldably operative are each of inflexible, rigid form.

The invention consists of certain advancements in this art as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose constructions, combinations and details of means, and the manner of operation will be made manifest in the description of the herewith illustrative embodiment; it being understood that modifications, variations and adaptations may be resorted to within the spirit, principle and scope of the invention as it is more directly claimed hereinbelow.

Figure 1 is a face-end elevation of the expanded-blade head of the tool, and

Figure 2 is a side elevation thereof.

Figure 3 is an elevation showing the self-contracting position of the head as when retracting into a reduced size bore.

This tool is capable of use with flexible sewer rods of the kind shown in my Patent No. 2,005,936, and includes a flexible shaft part 2 fixed in any suitable manner onto the end of a short, stiff rod 3. This rod is provided with a seat or shoulder 4 from which extends, co-axial with the rod 3, a non-circular mandrel part 5; here of polygonal cross-section. On this mandrel there is slidably mounted a substantial ring or collar 6 having a series of radial slots 7 in each of which there is a transverse pivot pin 8; the slots lying in planes normal to the mandrel.

In each slot there is mounted on its respective pin 8, a radial cutter blade 10 to swing in radial planes along the tool axis. Each blade is arched forward at its outer end and presents a lateral cutting edge 11 as to the tangential, bore-surface contact or rim face 12 of the blade; the tangentiality being with reference to a circle about the axis of the mandrel 5. The blades are of stiff and rigid type, or inflexible, and each has an eccentric, front face hub body 13 which is in constant, slidable engagement with a spherical-end cam collar 14 fixed on the forward end of the mandrel 5.

The blades all act concurrently with equal outward radial motion and pressure, and are designed for concurrent contraction and a means to effect this concurrent action, both outward and inward, here includes the said collar 6, the said ball cam 14 and a single master spring 16 which is compressed between the shoulder 4 and

the blade carrier or collar 6 and surrounds the mandrel 5.

In use of the tool the head blades 10 are squeezed toward each other until the set can be pushed into the open, contiguous end of the pipe bore or other tube to be cleaned and as soon as the blades are freed from grasp they will be automatically spread by the master spring 16 until they fit the bore lining, incrustations or wall surface. The tool will, when rotated to the right, Fig. 2, begin its cutting or scraping work and can be advanced axially as the bore is cut clean to the surface of the pipe.

The blades will automatically be spread by the master spring 16 as the work is radially cut away, and also the blades will automatically open as the head may advance from one size bore into a larger size bore in a line of pipe or conduits.

In event that the head may work forward to an impassable barrier then the string of rods and the tool head can be retracted through the cleaned hole. In this action the several blades will fulcrum on the ball cam 14 with enough leverage to force the carrier collar 6 back and compress the master spring 16, Fig. 3.

A uniform pressure is applied by the spring 16 to all of the blades by way of the carrying collar 6 and this is effective in keeping the driving mandrel on bore center. The spring 16 is preferably of conoidal-helix form so that its coils may flatly collapse as the carrier collar 6 is repressed. This enables the use of a very short axial-length tool head, as indicated in Fig. 2, to facilitate the movement of the head through quite acute pipe bends. The length of the stiff axial body is here about equal to or less than the closed diameter of the set of blades.

What is claimed is:

1. A borer, for cleaning bores, including an axial body, a collar, having a set of expansible, radial blades, said collar being splined on the body to rotate the blades, means normally axially shifting the blades and means responsive to said axial shifting to expand the blades.

2. A borer of the class described, including a mandrel having a splined, non-tiltable collar, a shiftable set of radially expansible hubbed blades pivoted on the collar, yieldable means for normally shifting the set to expanded position of the blades as to the mandrel, and a cam abutment device fixed with respect to the mandrel and on which hubs of the blades fulcrum during shift of the set in either direction.

3. The borer of claim 2; said cam and the blades constructed and arranged to cooperate so that inward depression of any one of the blades will shift the collar axially against the yieldable means whereby to permit a like inward movement of the other blades.

4. A bore borer including a rotative mandrel, a co-rotative collar splined on the mandrel, a set of independent blades having hubs pivoted on the collar on axes transverse to the mandrel, a fixed cam abutment on the mandrel and said hubs having faces eccentric to their pivots and slidable on the cam to radially move the blades, and a spring normally thrusting the collar toward the said cam.

5. The borer of claim 2, said cam abutment device having a ball-shaped face engaged by contiguous hubs of the blades.

6. The borer of claim 2, and in which the said yieldable means comprises a conical spring whereby to permit the use of a short body part about which the coils of the spring may telescope to a flat arrangement.

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