May 6, 1941. R. STYLES 2,240,897

VALVE SPRING COMPRESSOR

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Fig. 1

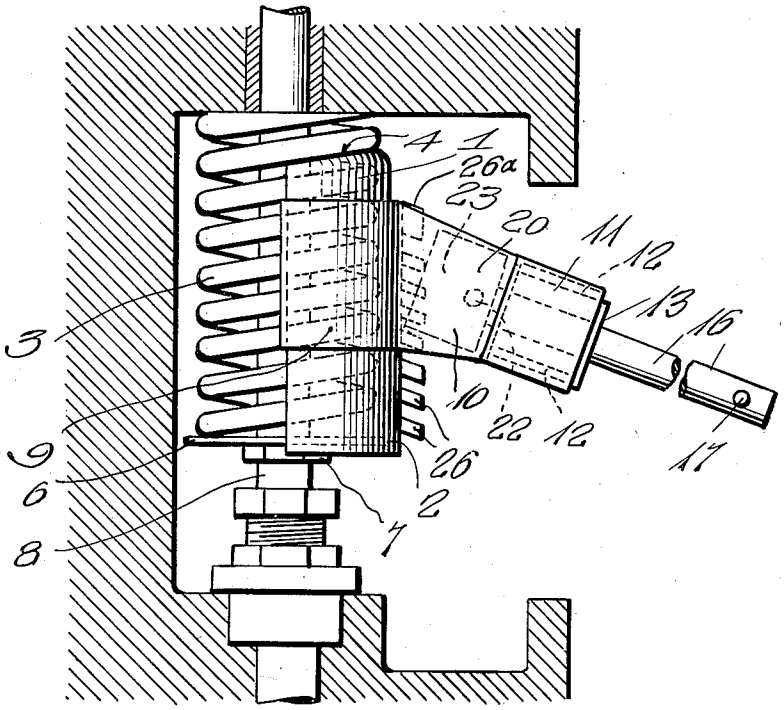
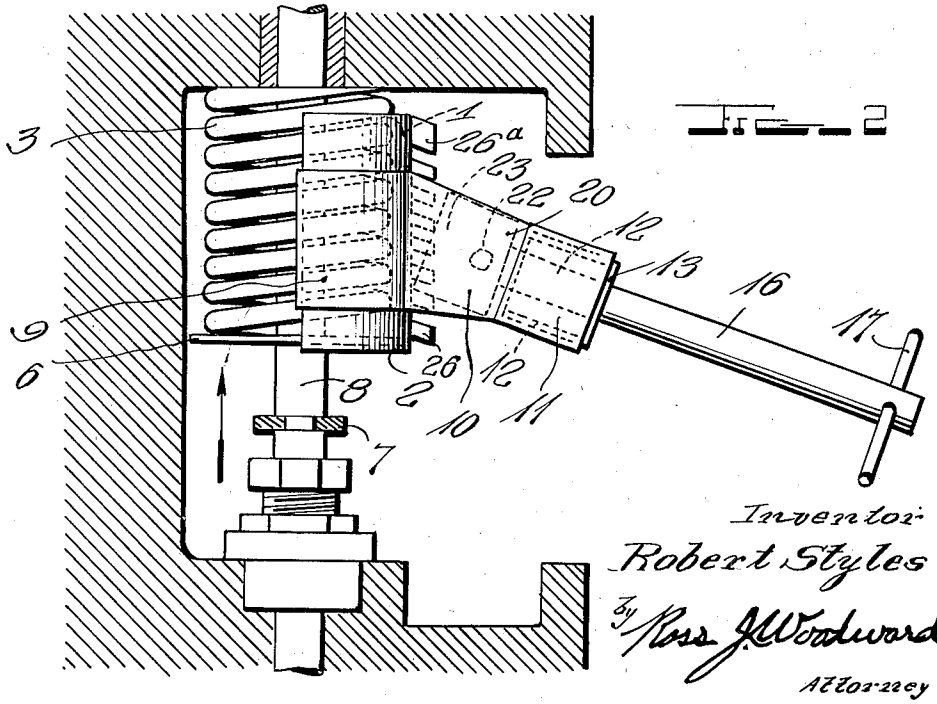



Fig. 2

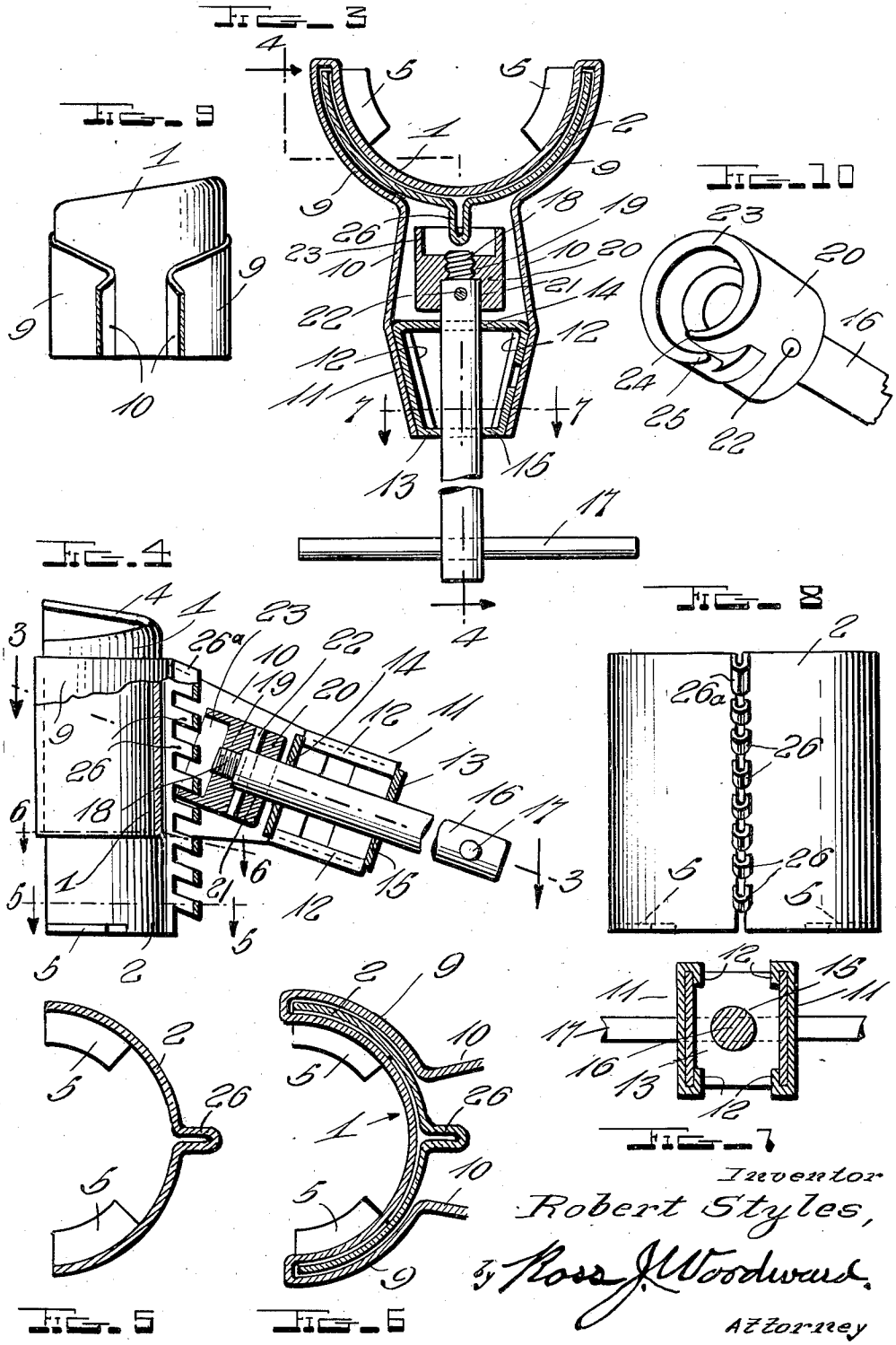



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# UNITED STATES PATENT OFFICE

2,240,897

## VALVE SPRING COMPRESSOR

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Application November 1, 1939, Serial No. 302,431

4 Claims. (Cl. 29—86.3)

This invention relates to a spring compressor and it is one object of the invention to provide a device of this character which is particularly adapted for use as a tool for compressing a valve spring and effecting longitudinal contraction thereof when adjustment, repairs or replacements are to be made.

Another object of the invention is to provide a compressor including companion jaws so associated with each other that when the compressor is in use, one jaw will be shifted longitudinally of the other and convolutions engaged by the two jaws urged toward each other to effect contraction of the spring.

Another object of the invention is to provide a spring compressor wherein one jaw carries wings slidably mounting the other jaw and having extensions constituting a mounting for a rotatable shaft carrying at its inner end a head so formed that, as the shaft is turned, the head will act upon teeth of the second jaw to shift the same longitudinally relative to the first jaw and cause the spring which is engaged by the two jaws to be compressed longitudinally.

Another object of the invention is to provide a spring compressor wherein the two jaws and the shaft mounting carried by one jaw may be formed of sheet metal, thus producing a compressor which is strong and durable, light in weight, and capable of being manufactured at low cost.

Another object of the invention is to provide a spring compressor of such formation that it may be very easily applied to the spring of a valve of any internal combustion engine or other machine and the spring quickly compressed, retained in compressed condition as long as desired, and then permitted to expand and return to its original condition.

The invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a view showing the improved compressor in side elevation and applied to a valve spring to be compressed.

Fig. 2 is a view similar to Fig. 1, showing the spring compressed.

Fig. 3 is a sectional view taken transversely through the compressor on the line 3—3 of Fig. 4.

Fig. 4 is a sectional view taken vertically through the compressor on the line 4—4 of Fig. 3.

Fig. 5 is a transverse sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a similar view on the line 6—6 of Fig. 4.

Fig. 7 is a sectional view taken transversely through the shaft mounting on the line 7—7 of Fig. 3.

Fig. 8 is a front elevation of the movable jaw of the compressor.

Fig. 9 is a view showing the stationary jaw in front elevation with the arms or wings projecting therefrom in section.

Fig. 10 is a detail view of the operating head.

This improved spring compressor has a jaw 1, which will be termed a stationary jaw, and a companion jaw 2 which will be referred to as a movable jaw as it is shifted longitudinally of the jaw 1 when the tool is in use. These jaws are preferably formed of strong sheet metal, although other material may be used, and, upon referring to Figs. 3 and 6, it will be seen that the two jaws are arcuate transversely so that they will fit closely about a spring 3, as shown in Figs. 1 and 2, during use of the tool. The upper end of the jaw 1 is bent inwardly to form a lip 4 for engaging over a convolution of the spring and, in order that the lip may have flat contacting engagement with the spring, it extends spirally, as shown in Figs. 4 and 9, to conform to the spring convolutions which it overlaps and firmly grips. By curving the lip as the sheet metal is bent to form the same, it will conform to the transverse curvature of the convolution over which it extends and thus eliminate likelihood of the lip slipping out of firm gripping engagement with the spring. The lower end of the jaw 2 is provided with inwardly extending lips or flanges 5 spaced from each other and adapted to engage under the disk 6 upon which the lower end of the spring 3 rests. Ordinarily, this disk is held firmly against the abutment 7 carried by the valve stem 8, and urges the valve toward closed position but when the spring is compressed longitudinally and contracted, as shown in Fig. 2, this spring will no longer apply pressure to the valve and the abutment 7 may be removed and other repairs or adjustments made to the valve.

The movable jaw 2 is to be mounted for sliding adjustment longitudinally of the stationary jaw 1, and, in order to do so, there have been provided wings 9 formed integral with the jaw 1 and extending forwardly from opposite side edges thereof. These wings are of less height than the jaw 1 and are spaced outwardly therefrom in parallel relation to the jaw, as shown in Figs. 3 and 6. The wings terminate in spaced relation to each other and portions of the strips forming these wings are bent to form arms 10

which project forwardly or outwardly from the wings and terminate in front end portions 11.

The front end portions 11 have upper and lower tongues bent inwardly to form flanges 12. It will thus be seen that the forward end portions or necks 11 of the arms 10 are of channeled formation in order that they may carry an open frame or bearing 13. This bearing is formed from a strip of sheet metal bent as shown in Fig. 3, to provide side walls engaged in the channels defined by the flanges 12. The bearing tapers toward its outer end so that it will be braced against shifting longitudinally and the inner and outer walls of the bearing are formed with alined openings 14 and 15 to rotatably receive the shaft 16. This shaft is formed from strong metal and adjacent its outer or front end carries a handle 17 by means of which it is to be turned in the bearing or slid longitudinally through the openings 14 and 15. The bearing frame constitutes a lock for holding the arms 10 and their necks in proper spaced relation to each other and maintaining the wings 9 in such spaced relation to the stationary jaw that the jaw 2 may be freely shifted vertically between the jaw 1 and the wings.

At its inner end the shaft 16 has a reduced and threaded end portion 18 which engages in the threaded bore or opening 19 extending axially of the head 20 and communicating with the sockets 21 of the head. By this arrangement, the shaft may be thrust forwardly through the openings 14 and 15, the head 20 then applied and screwed tightly upon the shaft, and a pin 22 then passed through the head and the shaft to hold the head firmly in place and prevent it from working loose when turning motion is imparted to the shaft. An annular flange or wall 23 projects forwardly from the head 20 with its end portions 24 and 25 in spaced and overlapped relation to each other, thus forming of the wall a helical thread having its overlapped end portions feathered so that it may easily move into and out of engagement with the teeth 26 of the movable jaw when the shaft 16 and head 20 are turned. The teeth 26 form an integral part of the plate from which the movable jaw is formed and, from an inspection of Figs. 4 and 8 it will be seen that they consist of tongues or strips extending transversely of the plate midway the length thereof and crimped to form teeth which are U-shaped, as shown in Figs. 5 and 6, and disposed at a downward incline conforming to the angle at which the shaft 16 and head 20 extend. Therefore, when the flange or thread 23 is engaged with the rack formed by the teeth 26, a very good connection will be established and there will be no danger of the thread 23 slipping out of engagement with the rack. By forming the upper tooth $26^a$ of greater depth than the other teeth, this large tooth will be prevented from passing between overlapped ends of the thread 23. It will therefore serve as an abutment to limit sliding of the jaw 2 in one direction and complete separation of the jaw 2 from jaw 1 when moved in this direction will be prevented.

When the compressor is in use, it is applied to the valve spring of an internal combustion engine, as shown in Fig. 1, with the flange 4 of the stationary jaw engaged over a convolution of the spring near the upper end thereof and the flanges 5 of the movable jaw engaging under the disk 6 on which the lower end of the spring rests. The arms 10 of the stationary jaw are grasped with one hand and the handle 17 is grasped with the other hand, so that turning motion may be imparted to the shaft 16. As the shaft is turned, the thread of helical flange 23 of the head 20 will move from one tooth of the rack to another and the movable jaw will be progressively shifted longitudinally in a vertical direction to compress the spring and foreshorten it, as shown in Fig. 2. After the spring has been sufficiently compressed, it may be held in an elevated position permitting removal of the abutment 7 and necessary repairs, replacement or adjustments made. A tool having the flange 4 of its jaw 1 sloping downwardly towards the left, as shown in Figs. 1, 4 and 9 is for use upon a right hand spring. A tool having the flange 4 sloping towards the right instead of towards the left will be used for a left hand spring. After the necessary repairs or adjustments have been made and the abutment 7 replaced, the shaft is turned in a retrograde direction and the spring will be permitted to expand and apply tension to yieldably hold the valve closed. In view of the fact that portion 24 protrudes out further than portion 25 the teeth may be engaged full length during turning of the head 20 and the shaft 16. It should also be noted that when the spring is fully compressed it can be withdrawn with the compressor and also replaced in the same manner.

Having thus described the invention, what is claimed is:

1. In a spring compressor, a stationary jaw shaped transversely to fit about a helical spring, wings extending towards each other in spaced relation to the outer face of the stationary jaw and having arms extending outwardly from the stationary jaw in transverse spaced relation to each other, a bearing mounted between outer end portions of said arms, a movable jaw slidable vertically between the stationary jaw and said wings, teeth projecting outwardly from the movable jaw and forming a vertically extending rack between inner ends of the arms, a rotatable shaft journaled through said bearing and extending longitudinally of the arms between the same, and a head at the inner end of the shaft having a portion extending from the inner end thereof split and overlapped at one point to form a circumferentially extending spiral thread engaging between teeth of the rack transversely thereof for shifting the movable jaw vertically when the shaft is turned and holding the movable jaw in an adjusted position.

2. In a spring compressor, a stationary jaw shaped transversely to fit about a helical spring, wings formed integral with opposite side edges of the stationary jaw and bent to extend towards each other in spaced relation to the outer face of the stationary jaw, said wings being bent to form arms extending outwardly from the stationary jaw in transverse spaced relation to each other and having their outer portions converging outwardly and formed with upper and lower inwardly disposed flanges, a bearing between the converging outer portions of said arms and having upper and lower edges of its side portions engaged by the flanges to hold the bearing in place, a shaft rotatably mounted through said bearing longitudinally of the arms and having turning means at its outer end, a movable jaw shiftable vertically between the wings and the stationary jaw, teeth extending outwardly at a downward incline from the movable jaw and forming a vertically extending rack located between the arms in spaced relation thereto, and a

head at the inner end of the shaft and having a spiral flange projecting from its inner end and constituting a circumferentially extending thread for engaging between the teeth transversely of the rack and moving from one tooth to another for shifting the movable jaw vertically to adjusted positions when the shaft is turned.

3. In a spring compressor, a stationary jaw shaped transversely to fit about a helical spring, wings formed integral with opposite side edges of the stationary jaw and bent to extend towards each other in spaced relation to the outer face of the stationary jaw, said wings being bent to form arms extending outwardly from the stationary jaw in transverse spaced relation to each other and having their outer portions converging outwardly and formed with upper and lower inwardly disposed flanges, a strip bent to form an open bearing disposed between the converging portions of said arms with upper and lower edges of its side portions engaged by the flanges to firmly mount the bearing between the arms, a shaft journaled through the bearing and extending longitudinally of the arms between the same, the inner end of the shaft being reduced and threaded, a head having a socket receiving the inner portion of the shaft and a threaded bore receiving the threaded end of the shaft, a movable jaw slidable vertically between the wings and the stationary jaw, a rack extending vertically along the movable jaw between the inner end portions of the arms, and a spiral flange projecting from the inner end of the head and constituting a circumferentially extending thread moving between teeth of the rack from one tooth to another to shift the movable jaw vertically to adjusted positions when the shaft is turned.

4. The structure of claim 1 wherein the movable jaw consists of a plate having side portions connected by a row of tongues spaced vertically from each other, the side portions of the plate being shaped to fit between the stationary jaw and the wings and the tongues being bent to form outwardly projecting teeth constituting a vertically extending rack located between inner ends of the arms of the stationary jaw for engagement by the thread of the head at the inner end of the adjusting shaft.

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