March 26, 1935. C. L. BRACKETT 1,995,665

VALVE OPERATING MECHANISM

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Fig. 1.

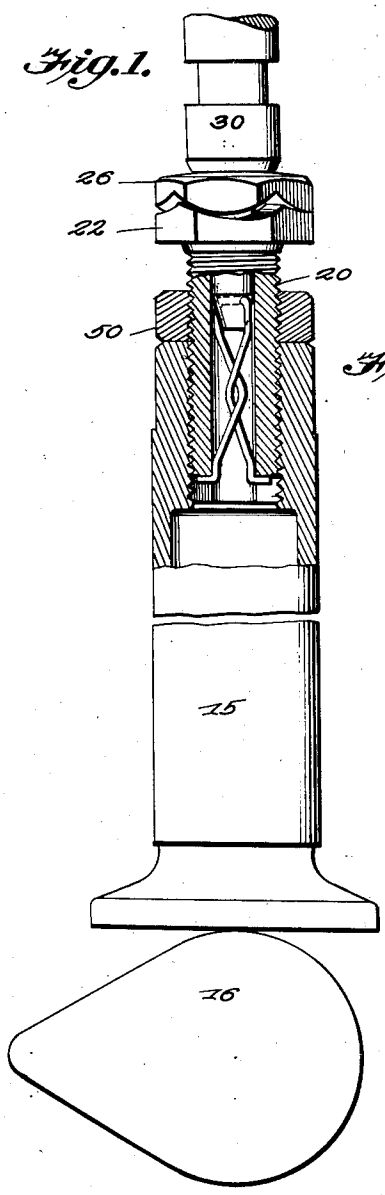


Fig. 2.

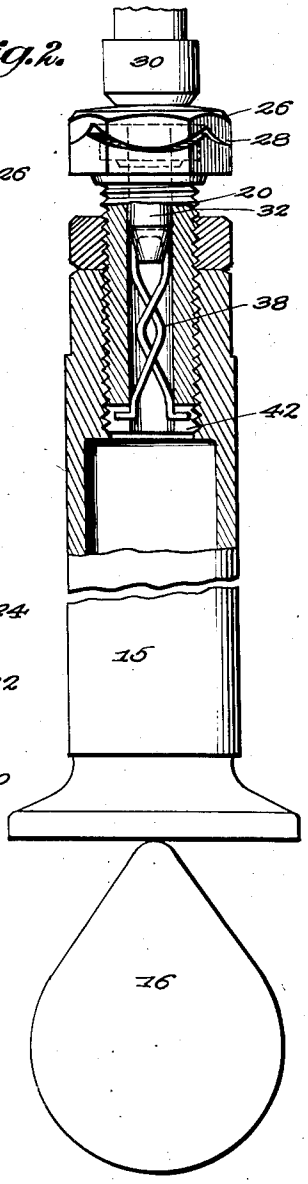


Fig. 3.

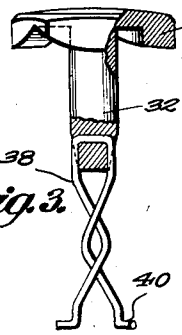


Fig. 4.

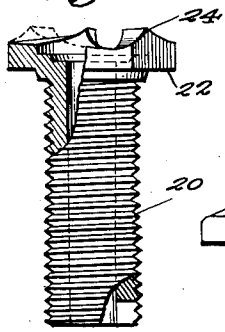


Fig. 5.

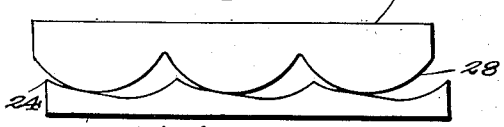


Fig. 6.

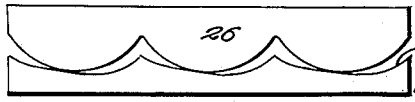
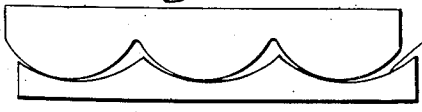


Fig. 7.



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Fig. 8.

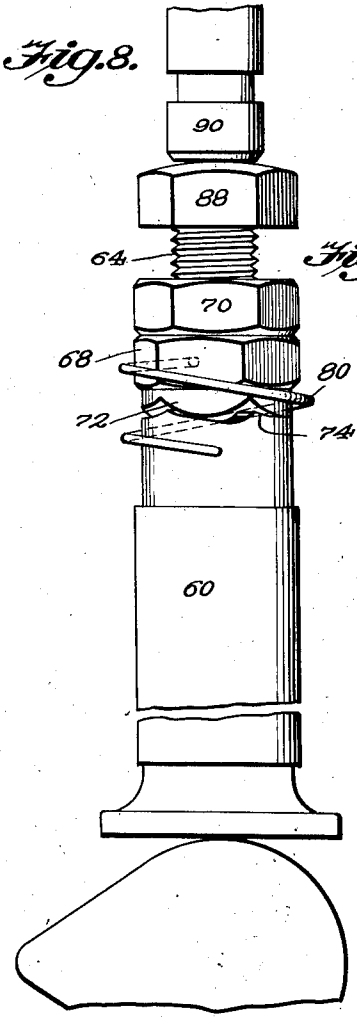


Fig. 10.

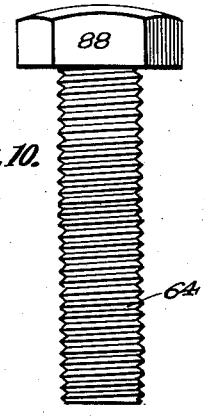


Fig. 11.

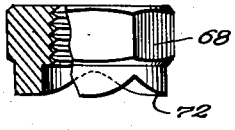


Fig. 12.

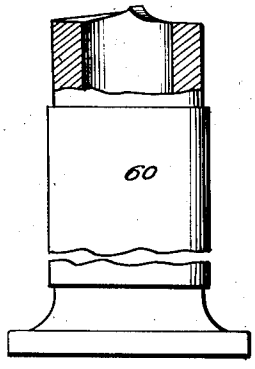


Fig. 9.

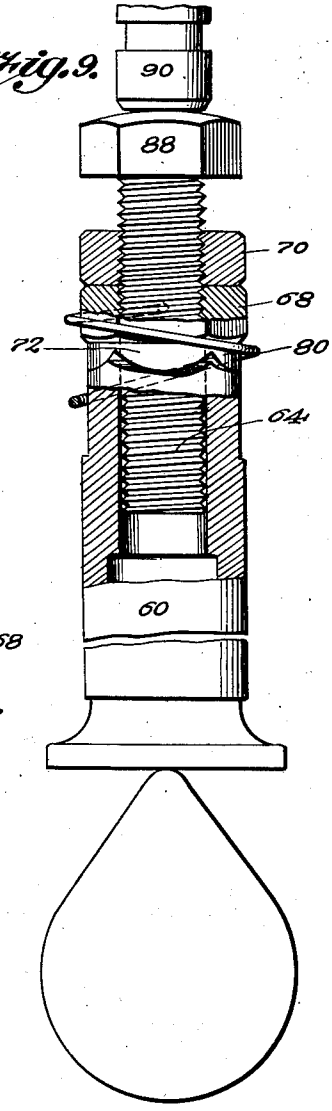


Fig. 13.

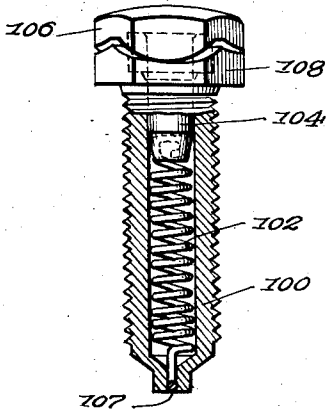
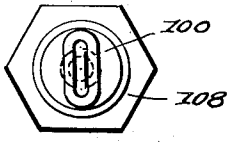


Fig. 14.



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UNITED STATES PATENT OFFICE

1,995,665

VALVE OPERATING MECHANISM

Clare L. Brackett, Detroit, Mich.

Application March 1, 1932, Serial No. 596,131

15 Claims. (Cl. 123—90)

This invention relates to valve lifters, especially adapted for use in internal combustion engines.

As is known, the conventional poppet valve of an internal combustion engine is unseated intermittently through the periodic advancement or ascent of a valve lifter and the varying temperatures encountered in the operation of an internal combustion engine require that a space or gap be provided between the valve lifter and the valve causing a tapping or clicking noise which is especially undesirable in pleasure vehicles and with an appreciation of this, the invention forming the subject of this application will be found to contemplate simple and automatic means by which the valve lifter is held in constant contact with the associated valve to avoid the tappet noise that inevitably accompanies the operation of the conventional poppet valve motor while at the same time there is reliable provision for compensation for expansion and contraction of the various parts due to temperature variations.

More specifically, the improved silencing mechanism as herein described, will be found to be incorporated in the tappet screw thereby providing a simple means by which the same may be applied to a conventional tappet either during course of original manufacture or at any time thereafter without other changes and without the exercise of unusual skill.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application and wherein like numerals are employed to designate like parts throughout the same,

Figure 1 is a fragmentary vertical sectional view through a valve lifter embodying the invention, the valve lifter being in the retracted or lowered position,

Figure 2 is a similar view with the valve lifter in advanced or elevated position,

Figure 3 is a side elevation of a contact element and associated spring embodied in the invention, parts being shown in section.

Figure 4 is a side elevation of the body of the improved tappet screw, parts being in section,

Figure 5 is a diagram illustrating the arrangement of the cams in the position shown in Figure 1,

Figure 6 is a diagram of the cooperating cams in the position shown in Figure 2,

Figure 7 is a diagram showing a slightly modified form of cam,

Figure 8 is a fragmentary side elevation illustrating a slightly modified form of valve lifter in use, the valve lifter being shown in the lowered or retracted position,

Figure 9 is a fragmentary side elevation of the valve lifter shown in Figure 8, the same being shown partly in section and in the elevated position,

Figure 10 is a side elevation of the tappet screw shown in Figures 8 and 9,

Figure 11 is a side elevation of a cam nut employed in the form of invention shown in Figures 8 and 9,

Figure 12 is a fragmentary side elevation of the tappet body shown in Figures 8 and 9,

Figure 13 is a side elevation of a modified form of tappet screw partly in section,

Figure 14 is an end elevation of the tappet screw shown in Figure 13.

In the drawings, the numeral 15 designates a tappet body which, as shown in Figures 1 and 2, rides on the lobe 16 of a cam shaft so that rotation of the cam shaft will bring about the intermittent advancement or elevation of the tappet.

As shown in Figures 1 and 2, the tappet body is bored longitudinally or is hollowed for lightness and has the upper portion thereof reduced in internal diameter and threaded for the reception of the tappet screw 20. The upper portion of the tappet screw is enlarged diametrically to form a head 22, the upper surface of which is formed with an annular series of undulations defining cams 24.

As shown in Figures 1 and 2, a contact element 26 of approximately the same diameter as the head 22 is mounted upon the head and is provided on the under side thereof with an annular series of undulations defining depending cams 28 riding upon the cams 24 and cooperating therewith in taking up the clearance necessary to provide for expansion and contraction of the various parts of the valve mechanism, it being noted in this connection that the stem 30 of a tappet valve is located in line with the valve lifter and in contact with the element 26.

With further reference to Figures 1 and 2 it will be seen that the contact element 26 is provided with a combined attaching member and pilot 32 extending into the bore of the tappet screw and having the lower portion thereof formed with a diametrical opening receiving the intermediate portion of a spring 38, the spring being in the form of a length of spring wire bent into approximately U-shape to define sides, the intermediate portions of which are coiled or twisted together to obtain the spring action necessary for the cooperation of the cams 24 and 28

in taking up the clearance in the line of motion between the head 26 and the associated valve.

The lower portions of the sides or legs of the spring 38 are extended angularly to define anchoring lugs 40 which, as shown in Figures 1 and 2, are received within the diametrical opposite radially extending notches 42 in the lower terminal portion of the tappet screw.

In Figures 5 and 6 it is shown that the active faces of the cams 24 are in the form of irregular curves having the rate of descent decelerated toward the lower terminals thereof where the same merge into the opposed abruptly rising sides of the contiguous cams. On the other hand, in Figure 7, the active faces of the cams designated by the numeral 240 are in the form of regular curves diminished in the rate of descent to the vanishing point, or nearly so.

By having the curvature of the active faces of the lower cams diminished in the rate of descent toward the lower ends thereof to the vanishing point or nearly so, the depending lobes 28 of the contact element 26 are held against intermittent engagement with the abruptly rising sides of the lower cams 24 and by avoiding such intermittent engagement, the noise that would result from such engagement is also avoided. In explaining this, it is pointed out that during the ascent of the screw 20 the depending lobes 28 of the contact element 26 will ride down the active faces of the lower cams to a point adjacent the lower ends thereof where the frictional contact between the upper and lower cams is sufficient to impart a motion transmitting engagement between the cams allowing the continued upward movement of the tappet screw 20 without further downward travel of the upper cams on the active faces of the lower cams. Thus, by diminishing the rate of descent of the active faces of the lower cams the upper cams are constantly held against engagement with the abruptly inclined surfaces of the lower cams. However, the depending cams may be allowed to ride to the extreme lower ends of the active faces of the lower cams.

In practice, the shank 32 of the contact head 26 is introduced into the bore of the screw 20 so that the lower laterally projecting ends 40 of the spring 38 may be received in the anchoring notches 42 and when the screw has been applied to the tappet body 15 as shown in Figure 1, the necessary clearance is provided between the lower end of the valve and the opposed surface of the contact element 26, this being accomplished with the aid of a feeler gauge or the like. When the tappet screw 20 has been adjusted for the proper clearance, the check nut 50 on the screw is tightened to hold the screw against turning with respect to the body and the contact element 26 is now turned in the proper direction to tension or load the spring 38. That is to say, each of the depending cams 28 is advanced beyond one or more of the upwardly extending cams 24 to load the spring 38.

Of course, to allow the contact element 26 to be turned over one or more of the upstanding cams 24 it is necessary to lift the associated valve out of the way. When the spring 38 has thus been tensioned, it will constantly urge the depending cams 28 up the active surfaces of the cams 24 thereby taking up the clearance initially provided between the contact element 26 and the associated valve.

In operation, the loaded spring 38 constantly urges the depending cams 28 upward on the cams 24 and when the tappet 15 is lifted through rotation of the cam shaft, the tension of the spring 38 will be overcome and the cams 28 will ride from relatively high points on the cams 24 to relatively low points on the cams 24. When the cam 23 rides down to the lower portion of the cams 28, an axial motion transmitting position is thus reached with the result that the valve 30 will be unseated. It is important to observe that regardless of the clearance initially provided between the contact element 26 and the associated valve the establishment of a lifting relation between the tappet 15 and the valve will not be accompanied by a clicking noise, this being true because the presence of the spring maintains constant pressure engagement between the contact elements 26 and 30.

During the entire valve unseating movement of the tappet and associated parts the relation of the cams 24 and 28 will remain substantially unchanged. This unchanged relation between the cams 24 and 28 will persist throughout the major portion of the descent of the tappet and the associated valve for the reason that the superior strength of the valve spring will prevail over the strength of the spring 38. However, when the tappet approaches the limit of its downward movement and immediately after the seating of the valve, the spring 38 will be allowed to assert itself and return the depending cams 28 to the relatively elevated positions shown in Figure 1, thereby maintaining uninterrupted engagement between the contact element 26 and the lower end of the associated valve stem.

By providing uninterrupted pressure engagement between the contact element 26 and the associated valve stem there is a complete obviation of intermittent contact between the tappet and the valve, which intermittent contact is recognized as the cause of the clicking noise so objectionable in the operation of conventional valve actuating mechanisms.

Should the valve stem expand as a result of an increase in the temperature of the motor, the depending lobes 28 will simply be restricted in their upward movement on the lower cams 24 but the valve is nevertheless allowed to fully seat and by the same token should the temperature of the motor drop and cause the valve stem to contract, an uninterrupted pressure engagement is maintained between the contact element 26 and the valve stem for the reason that the spring 38 will cause the cams 28 to ride higher upon the upstanding cams 24.

The silencing means herein disclosed in Figures 1–4 is shown to be incorporated in a tappet screw thereby making it possible to apply the improved tappet screw to a tappet of the present style without other changes in the motor and, of course, this may be done either during the course of manufacture of the motor or at any time thereafter without the exercise of special skill.

In the form of invention shown in Figures 8, 9, 10, 11 and 12, the tappet body is designated by the numeral 60 and has the upper portion thereof reamed or otherwise formed for the reception of the threaded lower portion of the tappet screw 64.

The tappet screw 64 is shown to have threaded engagement with cam and lock nuts 68 and 70 respectively, the lower end of the cam nut 68 being shown to be scalloped or undulated thereby defining a plurality of depending cams 72.

As shown in Figure 8, the depending cams 72 ride upon the cams 74 on the upper end of the

tappet body 60 in much the same manner as the cams 23 ride upon the cams 24. The active surfaces of the cams 74 decline from the peaks of such cams on regularly or irregularly curved surfaces and the rate of descent of the active faces from the upper ends thereof is diminished toward the lower portions of the cams to the vanishing point, or nearly so, where the same merge into the approach sides of the contiguous cams.

It is shown in Figure 8 that the convolutions of a coil spring 80 embrace the upper portion of the tappet body 60 and the cam nut 68 and constantly urge the depending cams 72 upward on the cams 74 thereby maintaining constant pressure engagement between the head 83 of the tappet screw and the lower end of the valve 90.

In the form of invention illustrated in Figures 13 and 14, the tappet screw 100 is bored longitudinally for the reception of a helical spring 102, the upper portion of which is centrally looped and is located in the diametrical slot or notch in the lower portion of the attaching shank and pilot 104. Obviously, the pilot 104 depends from the head 106 and is rotatably received within the bore of the tappet screw 100 thereby holding the head in place for the limited oscillation necessary to maintain a constant pressure engagement between the various parts of the valve actuating mechanism.

In carrying out the invention, the lower portion of the tappet screw 100 is crimped inward from opposite sides thereof into pressure contact with the looped lower portion 107 of the coil spring to serve as an anchor for the lower portion of the spring. Of course, in carrying out the form of invention shown in Figure 13, the contact element 106 and the head 108 are provided with opposed cooperating cams similar to the cams 24 and 28.

It will be seen that the depending cams in the various forms of invention are less in circumferential dimensions than the spaces between the elevated portions of the lower cams so that when the depending cams reach the limit of downward movement the same will be spaced from the approach sides of the lower cams and in this manner a clicking noise is avoided, it being apparent that were the depending cams allowed to come into intermittent contact with the approach sides of the upstanding cams, a clicking noise would result and interfere with the fulfillment of the purpose of this invention.

In all forms of invention herein disclosed, the interfitting undulations or scallops are carried by relatively fixed and movable members with the curvature of the scallops of the movable member substantially sharper than the curvature of the scallops of the fixed member. By this arrangement, the scallops of the movable member are positioned freely between the scallops of the fixed member with constant engagement between the active faces of the opposed scallops and ever present spaces or gaps between the inactive faces of the opposed scallops. In more specifically adverting to the fact that the inactive faces of the scallops are constantly spaced, it is pointed out that when the depending scallops ride down the active faces of the lower scallops, the same will come to a halt before contact is established between the opposed inactive faces of the cooperating scallops. Thus, there is avoided the clicking noise that would otherwise result upon completion of the downward movement of the depending scallops.

By way of summarizing the invention, it is pointed out that the same is in the nature of a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring and that the same comprises, in part, a driving member designated in Figure 1 by the numeral 15 and by the numerals 60 and 100 in Figures 8 and 13, respectively, such driving member having an annular series of sloping motion transmitting or active surfaces provided with base and outer portions. The driving member is also formed with inactive surfaces beyond the said base portions and forming continuations thereof. The driven member 26, or the corresponding parts in the several modifications, will be found to have reduced portions extending between the converging motion transmitting and inactive surfaces and having engagement with such motion transmitting surfaces, while being constantly spaced from the inactive surfaces.

The spring 38 in Figure 1, the spring 80 in Figure 8 and the spring 102 in Figure 13 will be found to constitute a means urging the associated driven member in the direction of the said outer portions of the motion transmitting surfaces against the contrary influence of the valve spring, the slope of the motion transmitting surfaces being diminished to the vanishing point as the same reach the base portions thereof and the said inactive surfaces so as to retard movement of the driven member toward the inactive surfaces under the influence of the said valve spring.

In other words, the driven member indicated in Figure 1 by the numeral 26, in Figure 8 by the numeral 68 and in Figure 13 by the numeral 106 is provided with a reduced portion extending freely between the converging motion transmitting and inactive surfaces of the driving member with a constant space established between such reduced portion and the inactive surface of the driving member due to the relative dimensions of the said reduced portion of the driven member and the recess defined by the converging motion transmitting and inactive surfaces of the driving member.

It is to be understood that the forms of invention herewith shown and described are to be taken merely as preferred examples of the same and that such minor changes in arrangement and construction of parts may be made as will remain within the spirit of the invention and the scope of what is claimed.

Having thus described the invention what is claimed is:

1. In a valve actuating mechanism, a tappet body having a plurality of undulations defining cams having peaks, a tappet screw extending into said body, a cam nut threaded on said screw and having a plurality of cams contacting with said first named cams.

2. In a valve actuating mechanism, a tappet body having a plurality of undulations defining cams having peaks, a tappet screw extending into said body, a cam nut threaded on said screw and having a plurality of cams contacting with said first named cams, and spring means anchored to said body and to said cam nut and having means urging the cams of said cam nut in the direction of the peaks of said first named cams.

3. In a valve actuating mechanism, a tappet body having an arcuate cam having a peak and a face declining from said peak, a tappet screw threaded into the body, a cam nut on the screw and having a rounded cam face contacting with the cam face of said first named cam face, and

a coil spring encircling the tappet body and the cam nut and being anchored to these parts.

4. In a valve actuating mechanism, relatively fixed and movable sections having interfitting scallops provided with opposed constantly contacting active faces and with opposed inactive faces, and a spring urging the active faces of the scallops of the movable section in the direction of the apexes of the scallops of the fixed section, the curvature of the scallops of the movable section being sharper than the curvature of the scallops of the fixed section to constantly space the opposed inactive faces of the scallops.

5. In a valve actuating mechanism, relatively fixed and movable sections having interfitting scallops provided with opposed constantly contacting active faces and with opposed inactive faces, and a spring urging the active faces of the scallops of the movable section in the direction of the apexes of the scallops of the fixed section, the rate of inclination of the active and inactive faces of the scallops of the movable section being sharper than the rate of inclination of the scallops of the fixed section to locate the scallops of the movable section freely between the scallops of the fixed section to constantly space the inactive faces of the fixed and movable sections.

6. In a valve actuating mechanism, a body having an annular series of undulations defining upstanding cams having apexes and alternating active and inactive curved surfaces, the active surfaces of the cams being regularly curved, a contact element having depending cams, and spring means anchored to said body and to said contact element and having means urging the second-named cams in the direction of the apexes of said first-named cams, the active surfaces of said upstanding cams being diminished in the rate of descent as the same approach the inactive faces of the upstanding cams to assist in halting the descending cams at points spaced from the inactive faces of the upstanding cams.

7. In a valve actuating mechanism, a body having an annular series of undulations defining upstanding cams having apexes and alternating active and inactive curved surfaces, the active surfaces of the cams being irregularly curved, a contact element having depending cams, and spring means anchored to said body and to said contact element and having means urging the second-named cams in the direction of the apexes of said first-named cams, the active surfaces of said upstanding cams being diminished in the rate of descent as the same approach the inactive faces of the upstanding cams to assist in halting the descending cams at points spaced from the inactive faces of the upstanding cams.

8. In a valve actuating mechanism, relatively fixed and movable sections having interfitting scallops provided with opposed constantly contacting active faces and with opposed inactive faces, the active faces of the fixed section having a rate of curvature diminished as the same approach the inactive faces of the scallops of the fixed section to assist in holding the movable section with the scallops thereof spaced from the inactive faces of the scallops of the fixed section, and a spring urging the active faces of the scallops of the movable section in the direction of the apexes of the scallops of the fixed section, the curvature of the scallops of the movable section being sharper than the curvature of the scallops of the fixed section to constantly space the opposed inactive faces of the scallops.

9. In a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring, a driving member having a sloping motion transmitting surface provided with base and outer portions, said driving member also being provided with an inactive surface beyond said base portion and contiguous thereto, a driven member for movable location between the valve and the driving member and engaging the said motion transmitting surface, means urging the driven member in the direction of the said outer portion of the motion transmitting surface against the contrary influence of the valve spring, the said slope of the motion transmitting surface being materially diminished as the same approaches the base portion and said inactive surface to retard movement of the driven member toward said inactive surface under the influence of said valve spring.

10. In a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring, a driving member having an annular series of motion transmitting surfaces provided with base and outer portions, said driving member also being provided with an annular series of inactive surfaces alternating with said motion transmitting surfaces and located beyond the base portions of said motion transmitting surfaces and contiguous thereto, a driven member for movable location between the valve and the driving member and engaging said motion transmitting surfaces, means urging the driven member in the direction of the said outer portions of the motion transmitting surfaces against the contrary influence of said valve spring, the said slopes of the motion transmitting surfaces being diminished materially as the same approach the base portions and said inactive surfaces to retard movement of the driven member toward said inactive surfaces under the influence of said valve spring.

11. In a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring, a driving member having converging sloping motion transmitting and inactive surfaces provided with base and outer portions, the inactive surface being beyond the base portion of said motion transmitting surface and forming a continuation thereof, a driven member having a reduced portion extending freely between said converging surfaces in constantly spaced relation to said inactive surface, means urging the said reduced portion of the driven member in the direction of the said outer portion of the motion transmitting surface against the contrary influence of the valve spring, the said slope of the motion transmitting surface being materially diminished as the same approaches the base portion and said inactive surface to retard movement of the driven member toward said inactive surface under the influence of said valve spring.

12. In a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring, a driving member having a sloping motion transmitting surface provided with base and outer portions, said driving member also being provided with an inactive surface beyond said base portion and contiguous thereto, a driven member for movable location between the valve and the driving member and engaging the said motion transmitting surface, spring means within said driven member and urging the driven member in the direction of the said outer portion of the motion transmitting surface against the contrary

influence of the valve spring, the said slope of the motion transmitting surface being materially diminished as the same approaches the base portion and said inactive surface to retard movement of the driven member toward said inactive surface under the influence of said valve spring.

13. In a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring, a driving member having a sloping motion transmitting surface provided with base and outer portions, said driving member also being provided with an inactive surface beyond said base portion and contiguous thereto, a driven member for movable location between the valve and the driving member and engaging the said motion transmitting surface, and a spring embracing said driving member and urging the driven member in the direction of the said outer portion of the motion transmitting surface against the contrary influence of the valve spring, the said slope of the motion transmitting surface being materially diminished as the same approaches the base portion and said inactive surface to retard movement of the driven member toward said inactive surface under the influence of said valve spring.

14. In a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring, a driving member having a sloping motion transmitting surface provided with base and outer portions, said driving member also being provided with an inactive surface beyond said base portion and forming a continuation thereof, a driven member for movable location between the valve and the driving member and engaging the said motion transmitting surface, means urging the driven member in the direction of the said outer portion of the motion transmitting surface against the contrary influence of the valve spring, the said slope of the motion transmitting surface being diminished to the vanishing point in the direction of said inactive surface to retard movement of the driven member toward said inactive surface under the influence of said valve spring, and a tappet screw carried by said driven member.

15. In a valve actuating mechanism for intermittently unseating a poppet valve against the contrary influence of a valve spring, a driving member having a sloping motion transmitting surface provided with base and outer portions, said driving member also being provided with an inactive surface beyond said base portion and contiguous thereto, a driven member for movable location between the valve and the driving member and engaging the said motion transmitting surface, means urging the driven member in the direction of the said outer portion of the motion transmitting surface against the contrary influence of the valve spring, the said slope of the motion transmitting surface being materially diminished as the same approaches the base portion and said inactive surface to retard movement of the driven member toward said inactive surface under the influence of said valve spring, a tappet screw carried by said driven member, and means adjustably locking said tappet screw to said driven member, said driving member being formed with a bore slidably receiving said screw.

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