S. T. DANKS.

REDUCING MOTION FOR ENGINE INDICATORS.

APPLICATION FILED OCT. 19, 1908.

923,952. Patented June 8, 1909.

Fig. 1.

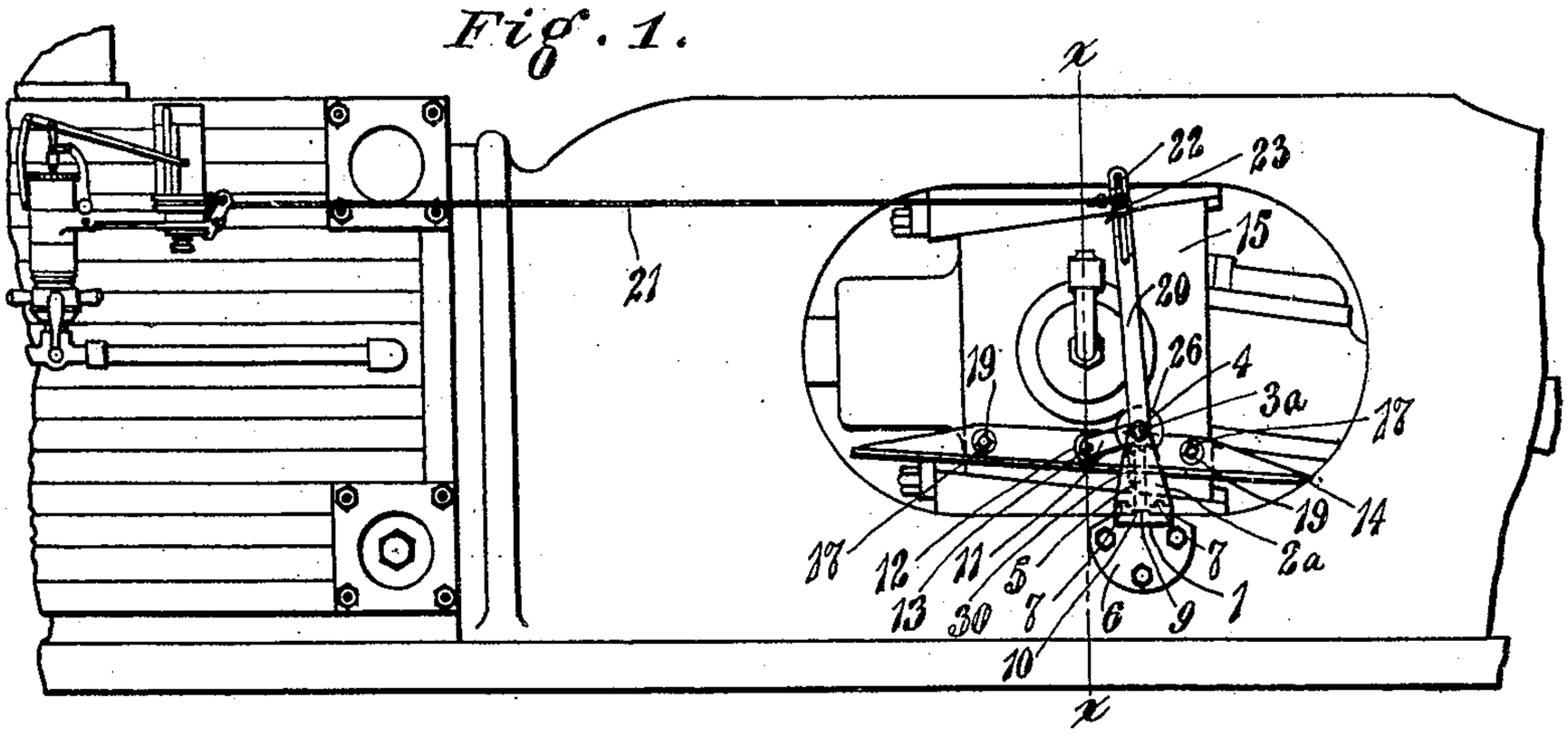


Fig. 2.

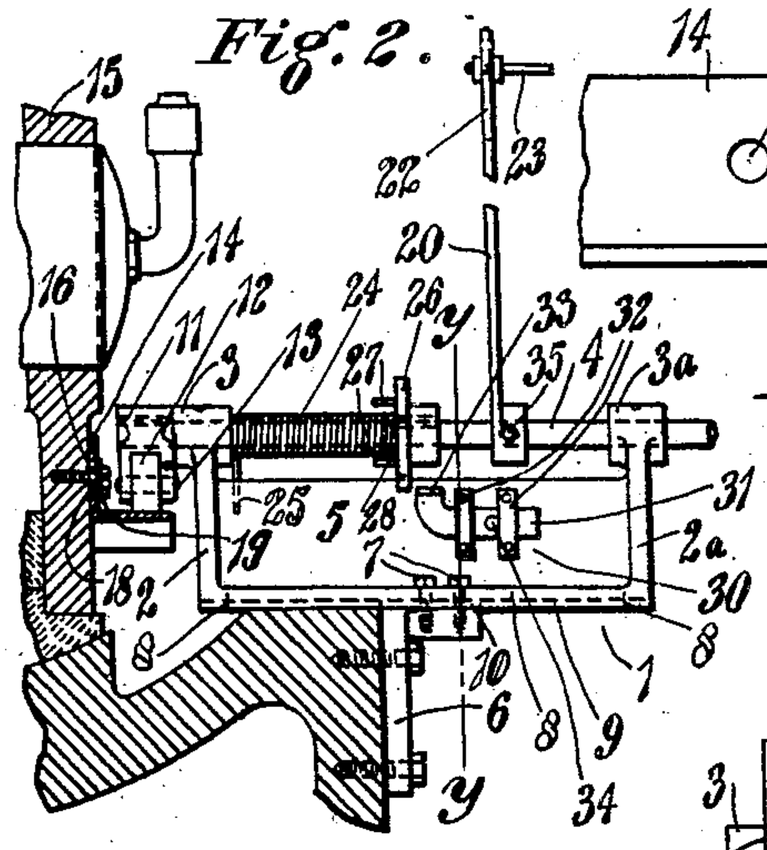


Fig. 3.

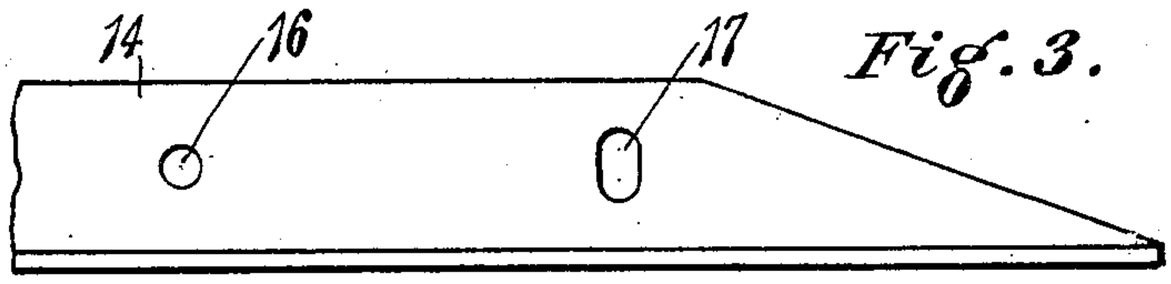


Fig. 4.

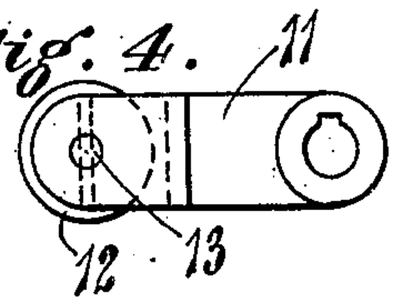


Fig. 5.

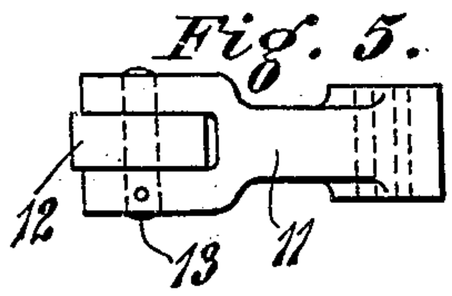


Fig. 6.

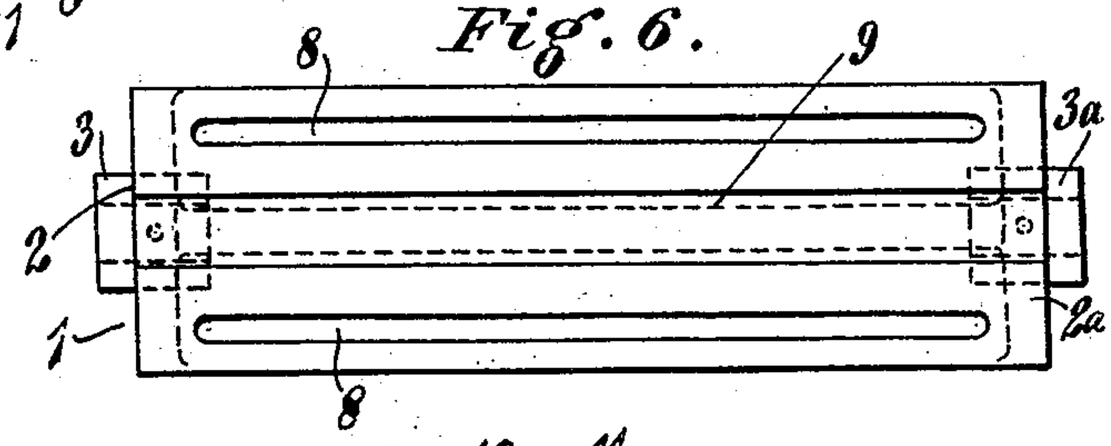


Fig. 7.

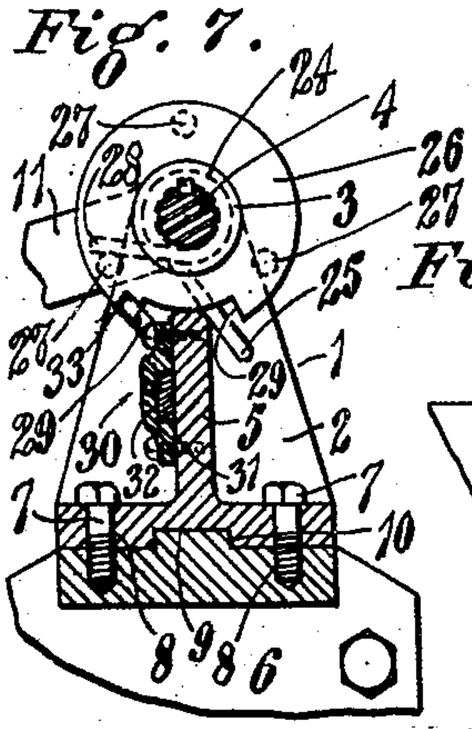


Fig. 8.

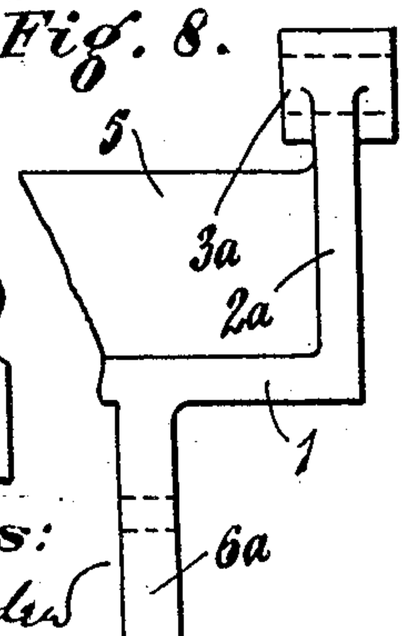
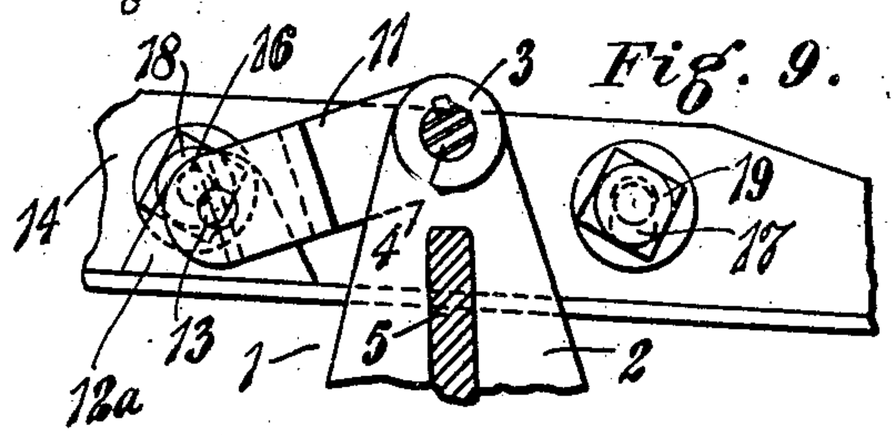


Fig. 9.



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UNITED STATES PATENT OFFICE.

SAMUEL T. DANKS, OF NORWOOD, OHIO.

REDUCING-MOTION FOR ENGINE-INDICATORS.

No. 923,952. Specification of Letters Patent. Patented June 8, 1909.

Application filed October 19, 1908. Serial No. 458,501.

To all whom it may concern:

Be it known that I, SAMUEL T. DANKS, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Reducing-Motions for Engine-Indicators, of which the following is a specification.

My invention relates to engine connections for indicators and its object is to decrease the inconvenience attendant upon applying an indicator to a stem engine, as well as to obtain greater durability and greater accuracy in the operation of the device.

My invention consists in the combination with a cam plate attached to a reciprocating part of the engine with a surface inclined to the line of reciprocation of the engine part, of a shaft journaled at right angles to the line of reciprocation of the engine part, a crank rigidly mounted on the shaft and having means for engagement with the inclined surface of the cam plate, and a lever also rigidly mounted on the shaft and having means for attaching it to the cord which actuates the indicator drum.

My invention also consists in the details of construction and arrangement of parts as will hereinafter be more fully described.

In the drawing: Figure 1 is a side elevation of part of an engine to which a device embodying my invention is applied. Fig. 2 is a partial cross section on a line corresponding to the line x—x of Fig. 1. Fig. 3 is a side elevation of part of the cam plate. Fig. 4 is a side elevation of the crank. Fig. 5 is a plan view of the same. Fig. 6 is a bottom plan view of the frame. Fig. 7 is a cross section on a line corresponding to y—y of Fig. 2. Fig. 8 is a side elevation of part of a frame of modified construction. Fig. 9 is a side elevation of part of a device embodying a modified construction of the contacting part on the crank.

Constructed as illustrated, my improved reducing motion consists in a frame 1 comprising an elongated base with bearing standards 2 and 2^a at each end, supporting bearings 3 and 3^a, respectively, for the horizontal shaft 4. These standards 2 are joined by a web 5 running longitudinally of the base. This frame 1 is adapted to be secured on the side of the engine frame near the middle point of the guides of the engine and is provided with a bracket 6 for this purpose. To adapt this device for use on engines of different sizes and designs, the bracket 6 is made slidable on the under side of the base of the frame 1 by securing it to the base by means of tap screws 7 taking through slots 8 running longitudinally of the base. One of these slots 8 is situated on each side of the web 5.

Preferably, for increasing the security of the fastening of the bracket 6 on the frame 1 the under side of the base of the frame is provided with a groove 9 running longitudinally of it and the upper side of the bracket 6 is provided with a lug 10 adapted to fit closely in the groove 9. The shaft 4 extends past the bearing 3 toward the cross head of the engine and a bifurcated crank 11 is rigidly mounted on the shaft. A roller 12 is located between the members of the bifurcated crank 11 and is journaled on a pin 13 passing through it and through the members of the crank. This roller 12 is adapted to bear on the surface of the cam plate 14 which is secured to the cross head 15 of the engine. Preferably, this cam plate is composed of a piece of angle iron, one leg of which, extending vertically, forms a means for securing it to the cross head, while the other leg, extending horizontally, presents its upper side to form a surface with which the roller 12 makes contact. This cam plate is so adjusted in securing it to the cross head that the surface with which the roller 12 makes contact will be inclined to the line of reciprocation of the cross head, and for allowing such adjustment to be readily made, the leg of the angle iron which is used for securing it to the cross head is provided with three openings. The middle opening 16 is circular and situated midway of the length of the cam plate, while the two other openings 17 are situated equally distant from the middle opening 16 in such positions that they will lie close to the ends of the cross head when the cam plate is applied thereto. These other openings 17 are elongated transversely of the length of the angle iron. Then, when the angle iron is secured to the cross head by passing a tap screw 18 through the circular middle opening 16, and other tap screws 19 are passed through the elongated openings 17 into the cross head, the cam plate may be turned slightly on the middle tap screw to vary the angle of its inclination to the line of reciprocation of the cross head. When it has

been adjusted to the proper angle the tap screws 19 may be tightened upon it, holding it firmly in its adjusted position. Then the roller 12 of the crank 11, bearing on the inclined surface of the cam plate, will be made to rise as the higher part of the cam plate passes under it or will be allowed to fall when a lower part of the cam plate passes under it. The crank 11, in which the roller is mounted, being rigidly secured to the shaft 4, the shaft will be caused to reciprocate upon the rising and falling of the roller 12, the degree of reciprocation depending upon the degree of inclination of the cam plate. A lever 20 is also rigidly mounted on the shaft 4 so that it will partake of the reciprocation imparted to the shaft 4, and it is to this lever 20 that the end of the cord 21 is attached, this cord passing around the pulley on the indicator drum and being adapted to reciprocate the drum as it is unwound or is allowed to wind back on the pulley in a manner which, being well known, need not herein be described. Preferably, for attaching the cord 21 to the lever 20, the lever 20 is provided with a longitudinally extending slot 22, near its free end, in which a stud 23 is slidably mounted, the cord being provided with a hook which may be engaged with this stud conveniently. With this arrangement the ratio of reduction of motion may be adjusted accurately, and, if desired, the hook may be engaged with the stud 23 while the lever 20 is in motion.

As is well known, the indicator drum is provided with a spring which causes it to turn in a direction opposite to the direction of unwinding of the cord. This spring under some conditions will be found ample to maintain the roller 12 in engagement with the inclined surface of the cam plate 14, but in other instances, such as in taking indicator diagrams of high speed engines, where the momentum of the parts of the reducing motion may become a factor not to be neglected, it is necessary to provide the shaft 4 with a special helical spring 24, which is coiled around the shaft 4 and has one of its ends 25 bearing against the web 5 near the bearing 3.

A disk 26 is rigidly mounted on the shaft 4 at some distance from the bearing 3 and provided with pins 27, with any one of which the other end 28 of the helical spring 24 may engage. This helical spring 24 thus having its ends confined, and being wound in the proper direction, maintains the roller 12 in engagement with the cam plate 14, and its pressure thus exerted may be varied by causing its end 28 to make contact with the different pins 27 in the disk 26, thus allowing the adjustment of the pressure of the roller 12 on the cam plate in accordance with the conditions imposed by the different speeds at which engines upon which the device is to be used may be operated. The disk 26 is of greater radius than the distance between the center of the shaft 4 and the upper edge of the web 5 and has a segmental section removed, leaving a space into which this upper edge of the web 5 extends when the disk 26 is in place upon the shaft. The extent of this segmental section is such that the ends 29 of the space are adapted to engage with the sides of the web 5 before the crank 11 may move in either direction far enough to come into engagement with any part of the cross head 15, which occurrence would be liable to result disastrously. For maintaining the roller 12 out of contact with the cam plate 14, when desired, a latch 30 is provided, consisting in a bar 31 mounted in brackets 32 on one side of the web 5, so that it may slide in a direction parallel to the length of the shaft 4. This bar 31 is provided with an upward extension 33 which, when the roller 12 is raised sufficiently, is adapted to enter the space left by the removal of the segmental part of the disk 26 and engage with the end 29 of the space. The bar 31 is also provided with a suitable handle 34, which is situated between the brackets 32 and serves to limit the longitudinal movement of the bar.

Preferably, considerable space is allowed between the disk 26 and the bearing 3^a, and the lever 20 is mounted on the shaft within this space and its rigid attachment to the shaft 4 consists in a set screw 35 so that this lever 20 may be released from its rigid attachment to the shaft and slid along the shaft 4 to any desired point within the space between the disk 26 and the bearing 3^a, and there again rigidly attached by means of the set screw 35. Thus, the device is provided with two adjustments, one being the adjustment of the frame of the device with respect to the engine frame, to allow for differences in sizes and designs of the engine as hereinbefore described, and the other being the adjustment of the lever 20 with respect to the frame of the device, to allow for differences in sizes and designs of the engine cylinders, as well as in differences in sizes and designs of the indicators used thereon, the object being to bring the lever into such position that the cord 21 will extend parallel to the line of reciprocation of the cross head and, consequently, of the piston of the engine.

It will, of course, be understood that either of the adjustments may be dispensed with and the dimensions of the device varied to adapt it for use with various styles of engines or indicators. Thus, as illustrated in Fig. 8 of the drawing, the frame 1 may have the bracket 6^a integral with it, in such position that when the frame is secured to the engine bed and the cam plate is secured to the cross head, the crank 11 will be in proper position to make contact with the inclined surface of the cam plate. The roller 12 is preferably constructed of a non-metallic material, such as fiber, in order to avoid noise in

the operation of the device. Another kind of contact piece for the crank 11 is the shoe 12[a], as illustrated in Fig. 9 of the drawing, the lower side of which is a plane surface conforming to the surface of the cam plate. This shoe 12[a] is pivotally mounted in the crank 11 in the same manner as is the roller 12. Such a shoe may be composed of metal without undesirably increasing the noise of operation of the device.

From the above description, it will be seen that while the motion of the engine parts may be accurately reduced as required in the operation of the indicator drum to produce a card on the desired scale, at the same time the simplicity of construction of the device and the directness with which the motion is transmitted render my improvement convenient and safe, without liability to derangement. The convenient means for bringing the device into and out of operative position decreases the danger attendant upon the use of the reducing motion upon high speed engines. Reducing motions of some kinds of construction necessitate the attachment of the cord while the engine and reducing motion mechanism is in rapid motion, which is dangerous to the operator, as well as inconvenient, often resulting in the breaking of the cord due to the sudden strain thrown upon it when it is attached. With the use of the latch 30, engaging with the disk 26, all parts may be adjusted and the cord may be attached, after which the mechanism may be started by the mere withdrawal of the latch. The general simplicity of the device adapts it for adjustment to various shapes and sizes of engines or to slight modifications in construction to facilitate its use with such various sizes and shapes of engines.

While I have shown and described specifically certain formations and proportions of the various parts of my improved device, I do not wish to be understood as being limited to the specific illustration and description contained herein, but

What I claim as new and desire to secure by Letters Patent is:

1. In a reducing motion for engine indicators, the combination with a cam plate, a pivotal attachment whereby the cam plate is secured to a reciprocating part of the engine and means for clamping the cam plate to said reciprocating part to prevent movement of the cam plate on its pivotal connection, whereby said cam plate may be adjusted with a surface inclined to the line of reciprocation of the engine part, of a shaft journaled at right angles to the line of reciprocation of the engine part, a crank rigidly mounted on the shaft and having means for engagement with the inclined surface of the cam plate, and a lever also rigidly mounted on the shaft, and having means for attaching it to the cord which actuates the indicator drum, substantially as and for the purposes set forth.

2. In a reducing motion for engine indicators, the combination with a cam plate adapted to be attached to a reciprocating part of the engine, with a surface inclined to the line of reciprocation of the engine part, of a shaft journaled at right angles to the line of reciprocation of the engine part, a crank rigidly mounted on the shaft and having means for engagement with the inclined surface of the cam plate, a lever also rigidly mounted on the shaft and provided with a longitudinally extending slot near its free end, and a stud adjustably secured in the slot in the lever, for attaching the lever to the cord which actuates the indicator drum, substantially as and for the purposes set forth.

3. In a reducing motion for engine indicators, the combination with a cam plate attached to a reciprocating part of the engine, with a surface inclined to the line of reciprocation of the engine part, of a frame mounted on the engine bed, adjacent to the reciprocating part, a shaft journaled in the frame at right angles to the line of reciprocation of the engine part, a crank rigidly mounted on the shaft and having means for engagement with the inclined surface of the cam plate, a lever also rigidly mounted on the shaft and having means for attaching it to the cord which actuates the indicator drum, a disk rigidly mounted on the shaft and having a segmental section removed, whereby a space is left, and a projection on the frame, extending into said space, the ends of the space being adapted to engage with the sides of the projection on the frame to limit the degree of reciprocation of the shaft and the aforesaid parts rigidly mounted thereon, substantially as and for the purposes set forth.

4. In a reducing motion for engine indicators, the combination with a cam plate attached to a reciprocating part of the engine, with a surface inclined to the line of reciprocation of the engine part, of a frame mounted on the engine bed adjacent to the reciprocating part, a shaft journaled in the frame at right angles to the line of reciprocation of the engine part, a crank rigidly mounted on the shaft and having means for engagement with the inclined surface of the cam plate, a lever also rigidly mounted on the shaft and having means for attaching it to the cord which actuates the indicator drum, a disk rigidly mounted on the shaft and having a segmental section removed, whereby a space is left, and a projection on the frame extending into said space, the ends of the space being adapted to engage with the sides of the projection on the frame to limit the degree of reciprocation of

the shaft and the aforesaid parts rigidly mounted thereon, and a latch mounted on the frame and adapted to engage with one end of the space to hold the crank in position with its engaging means out of the region of contact with the inclined surface of the cam plate, substantially as and for the purposes set forth.

5. In a reducing motion for engine indicators, the combination with a cam plate attached to a reciprocating part of the engine, with a surface inclined to the line of reciprocation of the engine part, of a frame, a bracket on the frame, said frame and bracket being adjustably secured together, a shaft journaled in the frame at right angles to the line of reciprocation of the engine part, a crank rigidly mounted on the shaft and having means for engagement with the inclined surface of the cam plate, and a lever also rigidly mounted on the shaft and having means for attaching it to the cord which actuates the indicator drum, the bracket being adapted to be rigidly secured to the bed of the engine, and the lever being adapted to be adjusted on the shaft, substantially as and for the purposes set forth.

6. In a reducing motion for engine indicators, the combination with a cam plate attached to a reciprocating part of the engine, with a surface inclined to the line of reciprocation of the engine part, of a frame, mounted on the engine bed adjacent to the reciprocating part, having bearings, a shaft journaled in the bearings on the frame, a crank rigidly mounted on the shaft and having means for engagement with the inclined surface of the cam plate, a lever also rigidly mounted on the shaft and having means for attaching it to the cord which actuates the indicator drum, a disk rigidly mounted on the shaft, a helical spring surrounding the shaft and confined between the disk and one of the bearings, having one end restrained by engagement with part of the frame, and a series of pins in the disk with any one of which the other end of the spring is adapted to be engaged to vary the pressure of the spring, substantially as and for the purposes set forth.

7. In a reducing motion for engine indicators, the combination with a cam plate attached to a reciprocating part of the engine, with a surface inclined to the line of reciprocation of the engine part, of a frame having slots running longitudinally of its base, a bracket slidable on the under side of the base, screws taking through the slots in the base, whereby the frame may be adjustably secured to the bracket, said frame comprising standards, bearings on the standards and a web running longitudinally of the base and joining the standards, a shaft journaled in the bearings, a crank rigidly mounted on the shaft adjacent to one of the bearings and having means for engagement with the inclined surface of the cam plate, movable with respect to the crank, a lever mounted on the shaft and slidable thereon, means for securing the lever rigidly to the shaft and means for attaching the lever to the cord which actuates the indicator drum, a disk rigidly mounted on the shaft, a helical spring surrounding the shaft and confined between the disk and one of the bearings, having one of its ends restrained by engagement with the web of the frame, a series of pins in the disk with any one of which the other end of the helical spring may be engaged to vary the pressure of the spring, the disk having a segmental section removed and the web of the frame extending into the space left by the removal of the section from the disk, whereby the ends of the space may engage with the web to limit the degree of reciprocation of the shaft and the aforesaid parts mounted thereon, a bracket on one side of the web, and a bar mounted in the bracket, the bar having an extension adapted to enter the space left by the removal of the section of the disk to engage with an end of the space to hold the crank in position with its engaging means out of the region of contact with the inclined surface of the cam plate, substantially as and for the purposes set forth.

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