Jan. 30, 1940. G. Y. ANDERSON, JR., ET AL 2,188,328

LOCK FOR PROPELLING MACHINERY

Filed Oct. 22, 1938 3 Sheets-Sheet 1

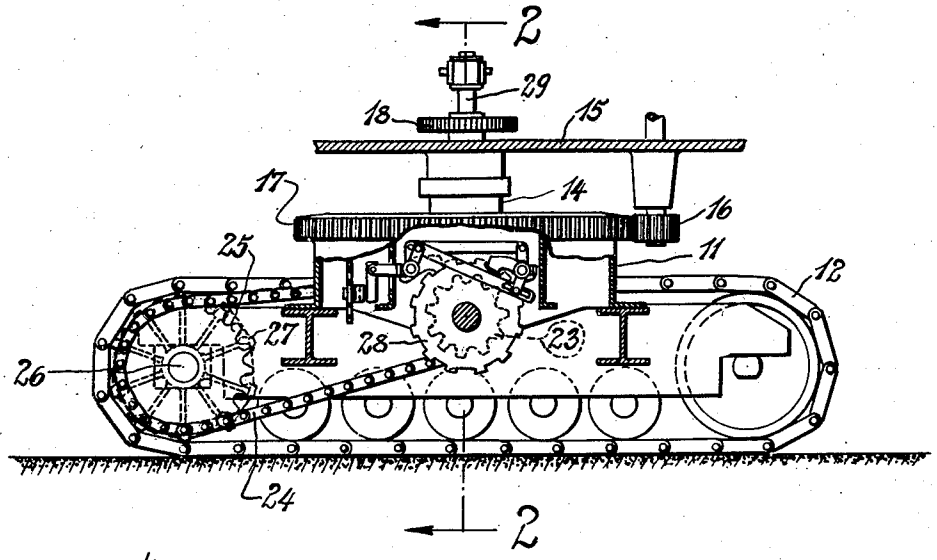


Fig. 1.

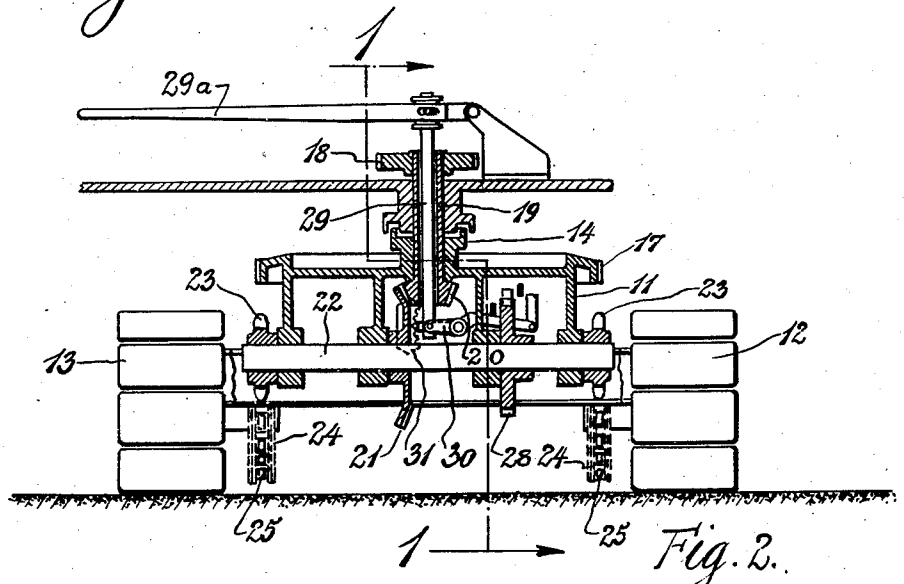


Fig. 2.

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LOCK FOR PROPELLING MACHINERY

Filed Oct. 22, 1938 3 Sheets-Sheet 2

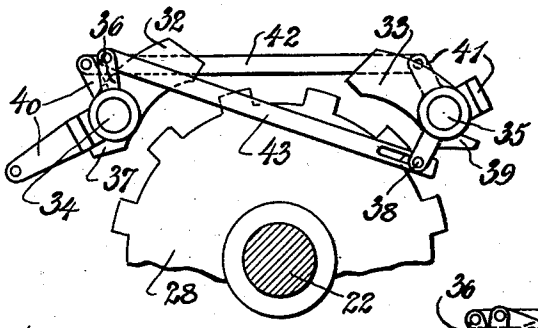


Fig. 3.

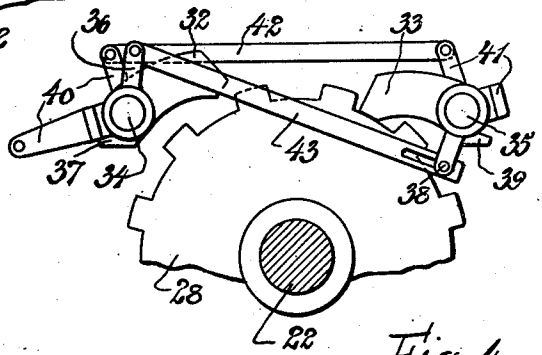


Fig. 4.

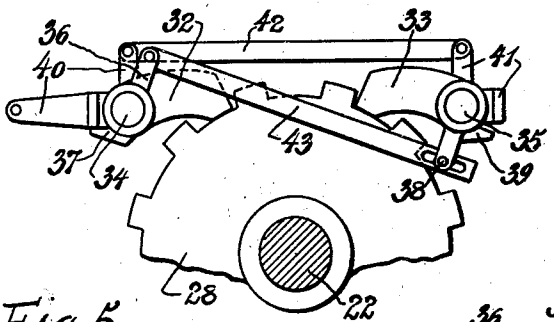


Fig. 5.

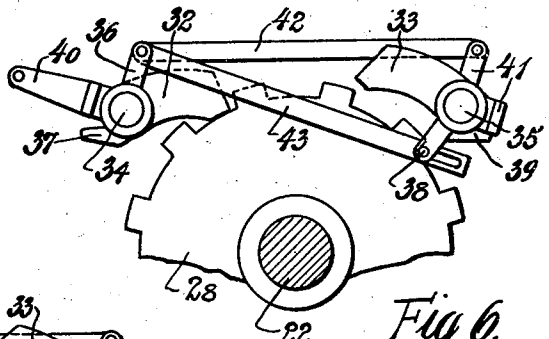


Fig. 6.

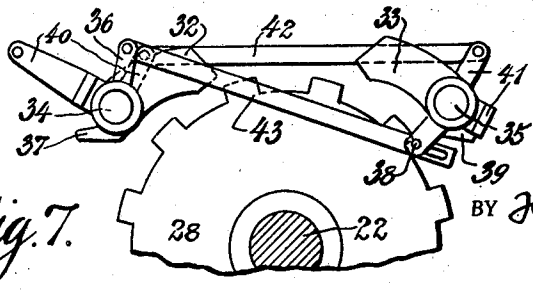


Fig. 7.

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LOCK FOR PROPELLING MACHINERY

Filed Oct. 22, 1938 3 Sheets-Sheet 3

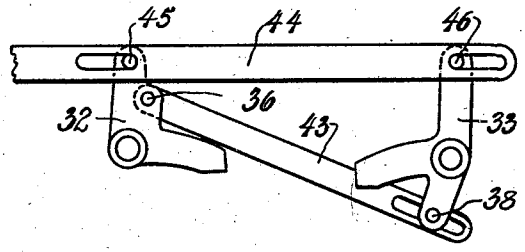


Fig. 8.

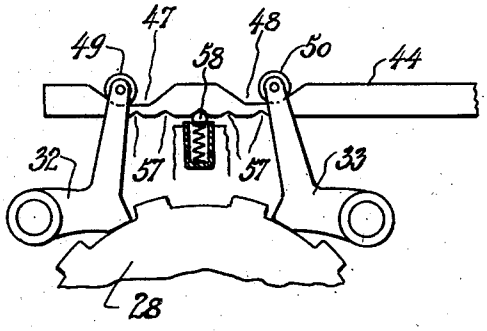


Fig. 9.

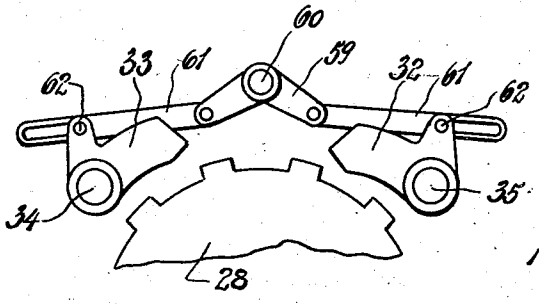


Fig. 10.

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Patented Jan. 30, 1940 2,188,328

UNITED STATES PATENT OFFICE

2,188,328

LOCK FOR PROPELLING MACHINERY

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Application October 22, 1938, Serial No. 236,388

16 Claims. (Cl. 188—30)

Our invention relates to new and useful improvements in locks for propelling machinery, and more particularly for the propelling machinery of a mobile crane, power-shovel, or the like, mounted on a turntable.

The traction units of such mobile outfits must be locked against motion when operating on a slope; and, even when on level ground, must be locked against being shifted by digging reactions and the like. The lock should preferably be controlled from the upper revolving frame, but this introduces complications which are difficult to meet. For example there should be provision to prevent the relative motion of the upper revolving frame and the traction base from changing the setting of the lock. The lock should preferably be such as can be set to resist motion of the traction in either direction, in both directions, or in neither direction.

In addition to our principal object, above stated, we have worked out a number of novel and useful details, which will be readily evident as the description progresses.

Our invention consists in the novel parts and in the combination and arrangement thereof, which are defined in the appended claims, and of which four embodiments are exemplified in the accompanying drawings, which are hereinafter particularly described and explained, together with several further variants of each of the four embodiments.

Throughout the description, the same reference number is applied to the same member or to similar members.

Figure 1 is a vertical section of that portion of a crane which embodies our invention, taken along the lines 1—1 of Figure 2.

Figure 2 is a vertical section, taken along the lines 2—2 of Figure 1.

Figures 3 to 7 show an enlargement of our lock per se, in five successive positions of lever-setting.

Figure 8 shows one position of an alternative form of lock.

Figure 9 shows one position of another alternative form.

Figure 10 shows one position of still another alternative form.

Turning now to Figures 1 and 2 we see that 11 is the traction base of a turntable crane, supported on creeping traction 12 and 13. About a pintle 14, carried by base 11, turntable 15 revolves, this revolving being accomplished by pinion 16, carried by the turntable an engaging circular rack 17 carried by the base. Pinion 16 is rotated by an appropriate engine (not shown) on the turntable.

Gear 18 on the turntable may be actuated by this same engine to convey propelling power through hollow shaft 19 within the pintle, pinion 20, gear 21, shaft 22, sprocket 23, chains 24, sprockets 25, and shafts 26 to traction driving tumblers 27.

Shaft 22 also carries ratchet wheel 28, but this ratchet wheel might just as well be at some other point in the drive train, provided that it is constrained to rotate with any motion of the creeping traction.

Inasmuch as the steering of the creeping traction is usually effected by brakes and/or clutches (not shown) on the base, it is advisable that ratchet wheel 28 be likewise on the base. Furthermore the ratchet wheel must be on the base to prevent rotation of the turntable from causing propelling.

In Figure 1 there will be seen, in conjunction with ratchet wheel 28, a system of two dogs and various rods connecting them. The elements of this system are not there numbered, inasmuch as the details thereof are shown in enlarged Figures 3 to 7, which will be discussed later herein.

From this system there extends a chain of control 29, through the center of the shaft 19 within the pintle 14, to a control-lever 29a on the turntable 15. See Figure 2 for this chain of control.

One of the elements of this chain of control is a lever 30, which engages (in any conventional manner, as by a spring-set latch) successive notches in a quadrant 31 or its equivalent, each notch corresponding to one of the five (or other number) positions in the cycle of the control. Locating this quadrant device on the traction base is one of the important features of our invention, inasmuch as this location prevents the relative vertical motion of the base and the turntable from altering the setting of the dog system. The operator can judge the proper setting of lever 29a, by the fact that he can feel in this lever the engagement of the spring-set latch on lever 30 with the successive notches of quadrant 31.

Turning now to Figures 3 to 7 for the details of the dog system, we see that two dogs 32 and 33, free to rotate on respective shafts 34 and 35, oppositely engage ratchet wheel 28. Arm 36 and boss 37 rotate with lefthand dog 32. Arm 38 and boss 39 rotate with righthand dog 33.

Bellcrank 40 is free to rotate on lefthand shaft 34. Bellcrank 41 is free to rotate on righthand

shaft 35. These bellcranks need not necessarily be on the same shafts as their dogs; for example, they might each be on a shaft parallel to the shaft which carries the corresponding dog, and rotate oppositely to its dog. Rod 42 constrains these two bellcranks to rotate in unison. The long arm of lefthand bellcrank 40 is actuated by the train of control 29 shown in Figure 2.

Rod 43 extends from arm 36 on lefthand dog 32, and has at its further end a slot which engages arm 38 on righthand dog 33. Obviously this slot could instead be on the lefthand end of this rod; and/or arm 36 could extend downwardly and arm 38 upwardly.

In Figure 3, the long arm of lefthand bellcrank 40 is in its most depressed position. It engages boss 37 of lefthand dog 32 to such an extent as not only to raise this dog out of engagement; but also causes arm 36 of this dog to pull on lower rod 43 so far that the righthand end of its slot engages arm 38 on righthand dog 33, and raises that dog out of engagement too.

In Figure 4, the long arm of lefthand bellcrank 40 is not quite so depressed. Its degree of depressing is sufficient to still engage boss 37, and thus still hold lefthand dog raised out of engagement; but lower rod 43 is not now pulled quite so far to the left as before, and so its slot no longer constrains arm 38 to hold righthand dog 33 raised out of engagement.

In Figure 5, the long arm of lefthand bellcrank 40 is now raised sufficiently so as no longer to hold lefthand dog 32 raised out of engagement.

In Figure 6, the further clockwise rotation of this bellcrank operates through upper rod 42 to rotate righthand bellcrank 41 clockwise sufficiently far so that it engages boss 39 on righthand dog 33 and thus raises dog 33 out of engagement.

In Figure 7, the further clockwise rotation of righthand bellcrank 41 raises righthand dog 33 still further so that its arm 38 now engages the lefthand end of the slot in lower rod 43 and pushes this rod to the left, thus acting on arm 36 of lefthand dog 32 to raise that dog out of engagement as well.

Thus the five successive positions of lefthand bellcrank 40 give us five successive situations of the dogs 32 and 33 on the ratchet wheel 28, namely: (Fig. 3) both dogs out; (Fig. 4) left dog out and right dog in; (Fig. 5) both dogs in; (Fig. 6) left dog in and right dog out; and (Fig. 7) both dogs out.

In Figure 8, the position of the dogs corresponds to Figure 5. The bellcranks 40 and 41 and their connecting-rod 42 have been eliminated. Instead we have the slotted upper rod 44, slidably actuated by the control means, and engaging an arm 45 of lefthand dog 32, and an arm 46 of righthand dog 33. The other elements function as before.

In Figure 9, the lower rod 43 has been eliminated. Upper rod 44, as before, is slidably actuated by the control means. On its upper edge are two camways 47 and 48, respectively engaging wheels 49 and 50 on respective dogs 32 and 33.

The extreme left position of rod 44 raises both wheels, thus releasing both dogs. A slight motion to the right releases wheel 49, thus permitting the engagement of lefthand dog 32. Further motion releases wheel 50 too, thus permitting the engagement of both dogs, as shown in Figure 9.

Further motion engages wheel 49, thus releasing lefthand dog 32. Still further motion also engages wheel 50, thus releasing both dogs.

In this exemplification of our invention, in place of quadrant 31 of Figure 2, we have in Figure 9 a series of notches 57 in the bar 44, engaging spring-impelled ball 58. In the claims, the "means on the base, to releaseably hold the control means in each of the control positions" is intended to include this device as an alternative to the quadrant.

In Figure 10, bellcrank 59 is mounted on a shaft 60, which shaft is rotatable by the control means in any appropriate manner. The two arms of the bellcrank are preferably set at a rather wide angle to each other.

On each arm of the bellcrank is pivoted a rod 61, having a slot to engage a pin 62 on the upstanding arm of one of the dogs.

In midposition the shaft 60 should be at such a level with respect to the pins 62, and the arms of the bellcrank 59 should extend at such an angle to each other, that in that position each arm of the bellcrank will extend appreciably above or below the line joining the shaft and the adjacent pin. The angular movement of the bellcrank 59 equivalent to one step of the cycle should equal twice the angle between one arm of the bellcrank in its midposition, and the line joining the shaft 60 and the adjacent pin 62.

In Figure 10, the angle between the two arms of the bellcrank happens to be 120°, and the angle between one arm and the line joining the shaft and the adjacent pin happens to be 15°, so that the angular movement of the bellcrank equivalent to each step of the cycle is 30°.

In the midposition, as shown, both dogs are out. Rotation of the bellcrank 59 through 30° clockwise permits righthand dog 32 to engage the ratchet, while still holding lefthand dog 33 out. Rotation clockwise through 30° more permits lefthand dog 33 to engage, while leaving righthand dog 32 still engaged. Conversely for two 30° counterclockwise movements.

The same bellcrank could have been employed inverted on the same shaft, with no other change in results than to require reversal of the direction of rotation of the shaft.

In our claims, when we refer to a two-way ratchet, we intend to cover equally the equivalent two opposed ratchet wheels, each lockable by one of the two opposed dogs.

When we refer to an end of the rod 43 or the rod 44 as slotted, we intend to cover equally any equivalent means for permitting this end to move a certain predetermined distance relative to a dog before engaging and actuating that dog. Such an equivalent, for example would be to put a pin on the rod and transversely slot the arm on the dog.

Although in all four forms of our invention the dogs are shown as falling into place by their own weight, they might of course be spring-pressed.

It is to be understood that, although the order of our cycle of five positions is considered by us to be the optimum; yet some different order and/or number of positions might be employed. For example, provision might be made to have the condition of both dogs out occupy the central position in the cycle and the condition of both dogs in occupy one or both of the extreme positions; and/or one of the two extreme positions (and even the position next to it) might be omitted.

The first of these proposed alternatives could be accomplished, for example, in the device of Figure 9 by substituting projections for hollows, and vice versa, on the upper edge of rod 44. In

the device of Figure 10, it has already been accomplished. To invert the cycle of the device of Figure 10, so as to correspond with that of the other devices, all that would be necessary would be to revolve bellcrank 59 into an inverted position so that rods 61 are crossed, and then lengthen those rods somewhat. Or simpler still, place shaft 60 below the dogs, shorten the rods somewhat, and extend dog arms 62 downwardly instead of upwardly.

The second of these proposed alternatives could be accomplished, for example, in the device of Figure 9 either by limiting the leftward or rightward travel of rod 44, or by prolonging to the left or right respectively camway 47 or 48. In the device of Figures 3 to 7, this could be accomplished by limiting the clockwise or counterclockwise rotation of bellcrank 40, or by lengthening in one direction or the other the slot in rod 43. In the device of Figure 8, this could be accomplished by limiting the leftward or rightward travel of rod 44, or by lengthening in one direction or the other the slot in rod 43. In the device of Figure 10, this could be accomplished by limiting the rotation of bellcrank 59 in one direction.

Although we have worked out appropriate methods of inverting the cycle of the device of Figures 3 to 7 and the device of Figure 8, these methods would require additional drawings for the exemplification, and so will not be given here.

Other similar changes can be made, if some other cyclical order of operations is desired.

Having now described and illustrated four forms of our invention, we wish it to be understood that our invention is not to be limited to the specific form or arrangement of parts herein described and shown, or specifically covered by our claims.

We claim:

1. In a mobile crane or the like, the combination of: a traction base; a turntable, mounted thereon; means, on the base, for locking the traction; control means, extending from the locking means to the operator's station on the turntable; and means on the base, to releasably hold the control means in each of its control positions.

2. In a mobile crane or the like, the combination of: a traction base; a turntable, mounted thereon; a two-way ratchet, constrained to rotate with the traction; a dog to oppose the rotation of this ratchet in one direction; a dog to oppose the rotation of the ratchet in the opposite direction; control means, extending from the dogs to the operator's station on the turntable; a control lever for this control means, the lever having four positions as follows: (1) both dogs out, (2) one dog in and the other dog out, (3) both dogs in, and (4) the other dog in and the one dog out; and means on the base, to releasably hold the control means in each of its control positions.

3. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; means, actuated by the control means, and having four positions, namely: (1) to extremely raise one dog, (2) to barely release that dog, (3) to release neither dog, and (4) to barely release the other dog; and means, interconnecting the two dogs, whereby extreme raising of one dog will release the other.

4. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; means, actuated by the control means, and capable of raising or lowering the dogs individually; and interconnecting means, whereby extreme actuation of the control means in the direction to actuate one dog will similarly actuate the other dog.

5. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; a rod actuated by the control means, and having an operative connection with each of the two dogs in such a way that different positions of this rod will either (1) extremely raise one dog, or (2) will barely release that dog, or (3) will release neither dog, or (4) will barely release the other dog; and means interconnecting the two dogs, whereby extreme raising of one dog will release the other.

6. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; a rod actuated by the control means, and having an operative connection with each of the two dogs, such that motion of the rod in one direction will release one of the dogs without releasing the other; and means interconnecting the two dogs, whereby extreme raising of one dog will release the other.

7. In a ratchet device, the combination of: a two-way ratchet; a shaft; a dog for the ratchet, mounted on the shaft; a second shaft; a second dog for the ratchet, mounted on the second shaft and opposed to the first dog; two rotating elements, one being mounted on each shaft; control means to rotate the two elements in unison; means on the first element to release the first dog, when the elements are rotated in one direction; means on the second element to release the second dog when the elements are rotated in the other direction; and a rod, having a fixed pivotal connection with one of the dogs, and a reverse-rotation sliding connection with the other.

8. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; means, actuated by the control means, and having four positions, namely (1) to extremely raise one dog, (2) to barely release that dog, (3) to release neither dog, and (4) to barely release the other dog; and a rod, having a fixed pivotal connection with one of the dogs, and a reverse-rotation sliding pivotal connection with the other.

9. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; a rod actuated by the control means, and having an operative connection with each of the two dogs in such a way that different positions of this rod will either (1) extremely raise one dog, or (2) barely release that dog, or (3) release neither dog, or (4) barely release the other dog; and a rod, having a fixed pivotal connection with one of the dogs, and a reverse-rotation sliding pivotal connection with the other.

10. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means, a rod actuated by the control means, and having an operative connection with each of the two dogs, such that motion of the rod in either direction will release one of the dogs without releasing the other; and a rod, hav-

ing a fixed pivotal connection with one of the dogs, and a reverse-rotation sliding pivotal connection with the other.

11. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; and a rod actuated by the control means, and having an operative connection with each of the two dogs in such a way that different positions of this rod will either (1) release both dogs, or (2) release only one dog, or (3) release neither dog, or (4) release only the other dog.

12. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; means to release one dog; means to release the other dog; and a sliding cam, actuated by the control means, to engage these two last mentioned means in such a way as successively to (1) release both dogs, (2) release only one dog, (3) release neither dog, (4) release only the other dog, and (5) release both dogs.

13. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; means to release one dog; means to release the other dog; and a sliding cam, actuated by the control means, to engage these two last-mentioned means in such a way as either (1) to release both dogs, or (2) to release only one dog, or (3) to release only the other dog, or (4) to release neither dog.

14. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; and a bellcrank actuated by the control means, and having an operative connection with each of the two dogs in such a way that different positions of this bellcrank will either (1) release both dogs, or (2) release only one dog, or (3) release neither dog, or (4) release only the other dog.

15. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; and a bellcrank actuated by the control means; and two rods, each pivotally connecting one arm of the bellcrank with one dog, one of each pair of pivotal connections being sliding.

16. In a ratchet device, the combination of: a two-way ratchet; a dog for the ratchet; a second dog for the ratchet, opposed to the first dog; control means; and a bellcrank actuated by the control means; and two rods, each pivotally connecting one arm of the bellcrank with one dog, one of each pair of pivotal connections being sliding; the bellcrank being so proportioned and so located with respect to the dogs, that rotation of the bellcrank one cycle-step in either direction from its mid position will leave the actuation of one dog virtually unchanged.

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