Feb. 10, 1953 F. G. NICOLAUS 2,627,752

ACTUATING MECHANISM ESPECIALLY FOR HAND LEVERS

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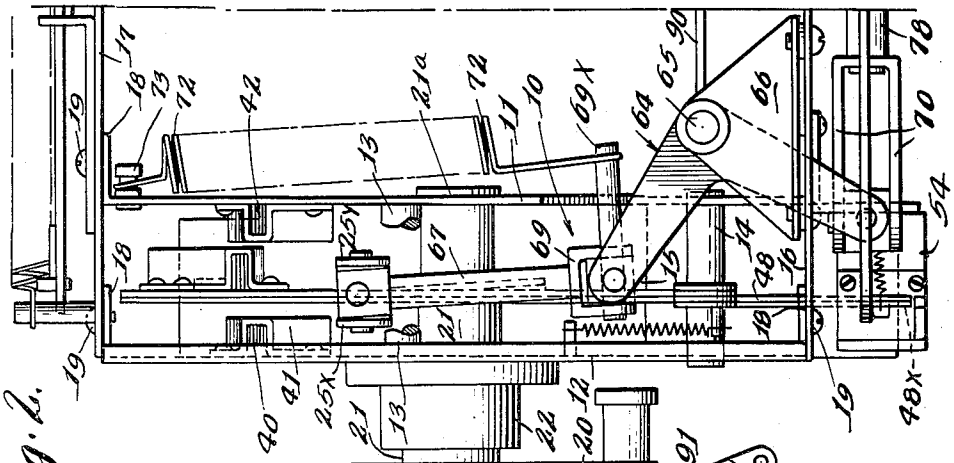

Fig. 2.

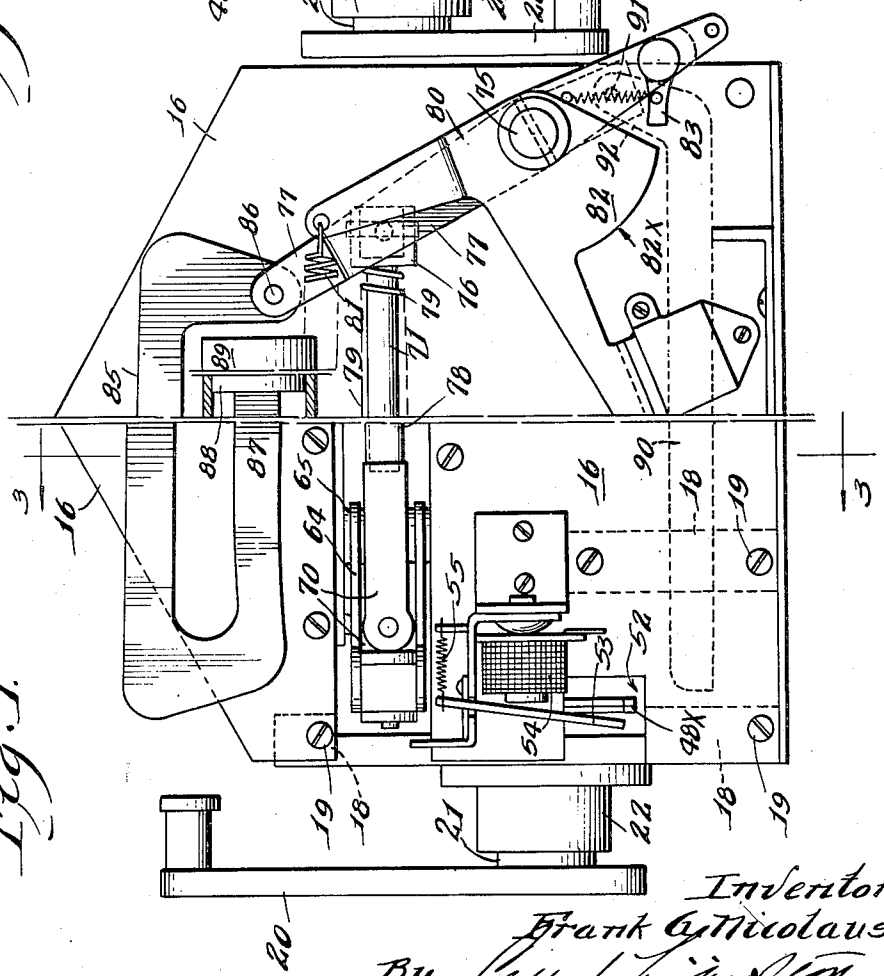

Fig. 1.

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Fig. 3.

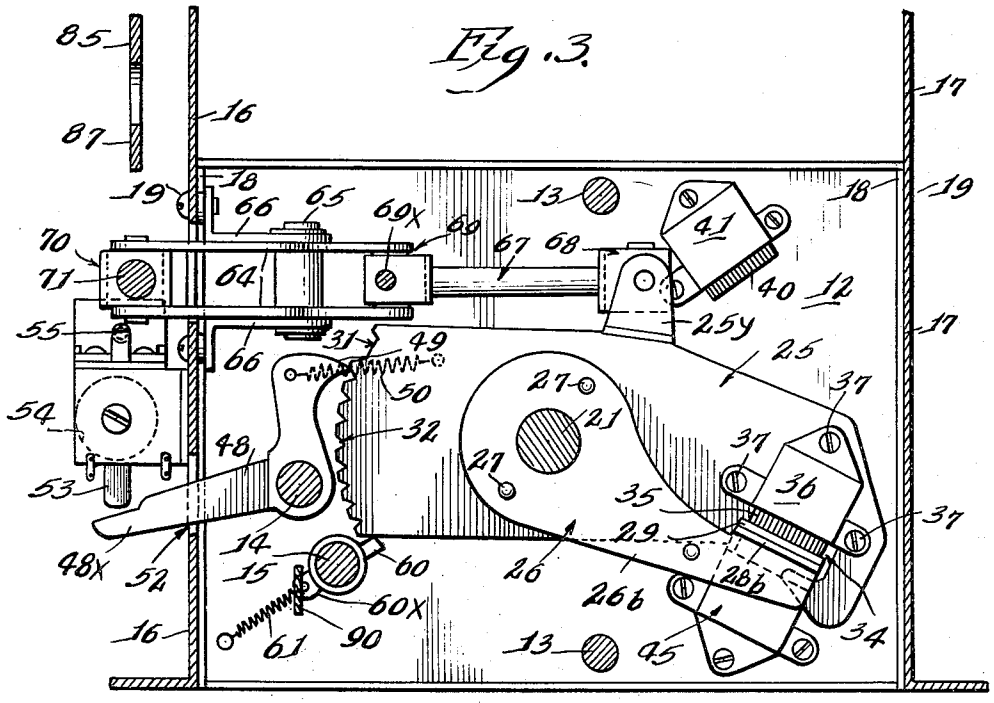

Fig. 4.

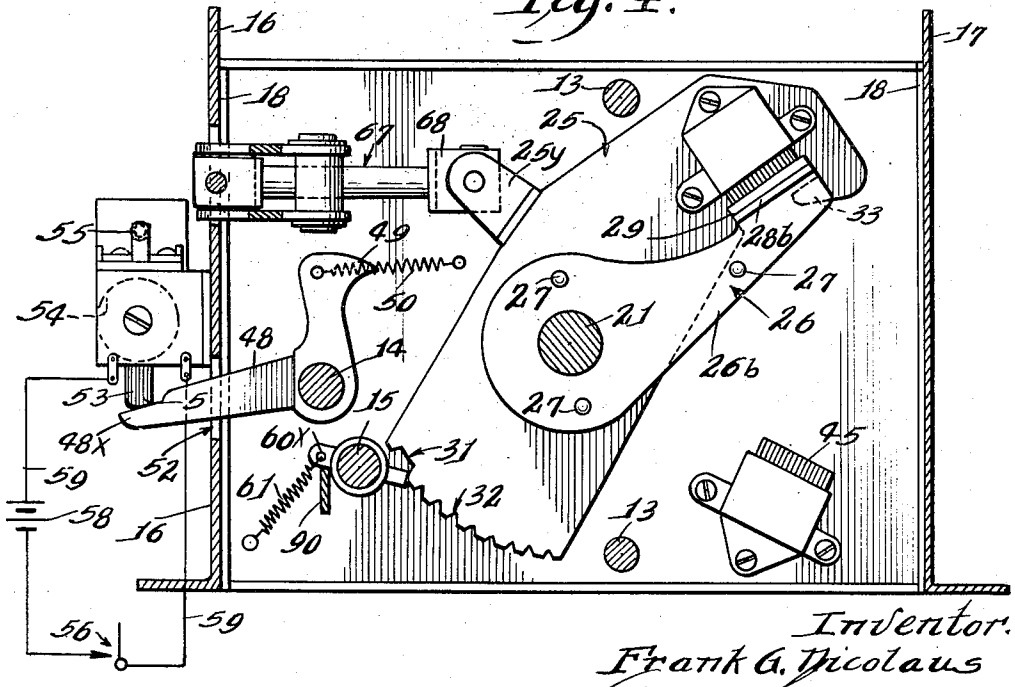

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Fig. 6.

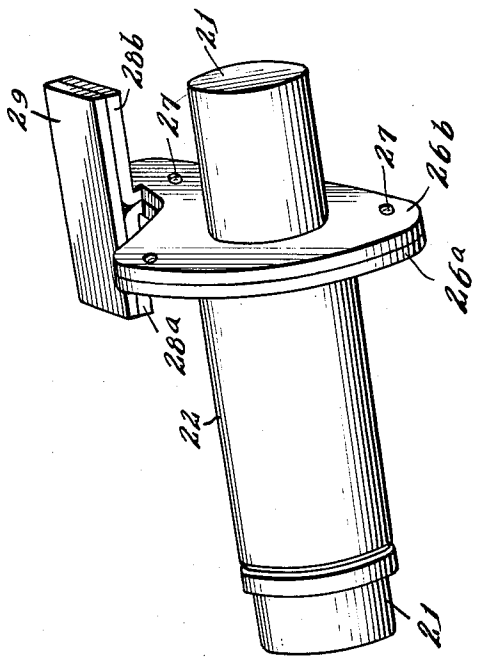
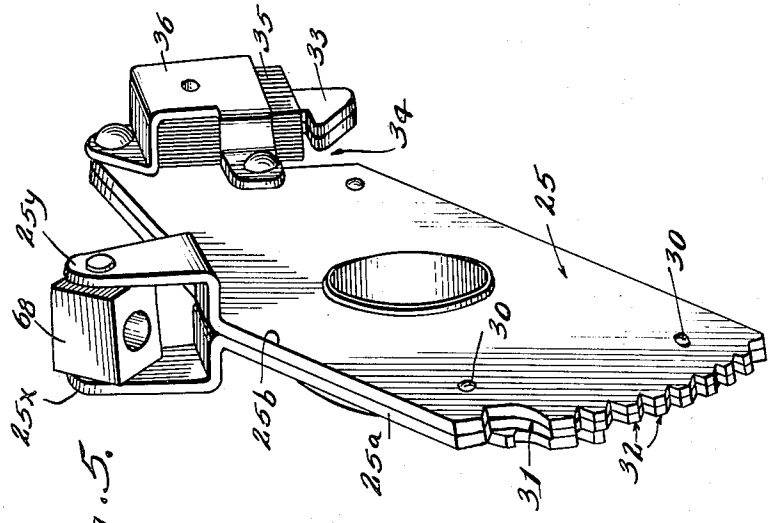


Fig. 5.



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UNITED STATES PATENT OFFICE

2,627,752

ACTUATING MECHANISM ESPECIALLY FOR HAND LEVERS

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Application June 27, 1947, Serial No. 757,369

14 Claims. (Cl. 74—17.5)

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This invention pertains to mechanical movements and particularly to a hand-lever actuating mechanism of general utility and application and especially useful in conjunction with shaft, wheel, and disc-spinning or rotating devices.

Important objects of the invention are the provision of a hand-lever actuating mechanism in the form of a compact unit readily adaptable to installation as part of any desired machine; the provision of such a mechanism in which a simplified full-stroke means makes it impossible to return the hand lever to starting position unless the same has first been displaced to the full extent of its normal operating stroke.

Additional objects are the provision, in a device of the class described, of a novel, simple, and highly effective electro-magnetic lock means normally preventing operative movement of the hand lever; the provision of a novel, simplified, and highly economical and effective lever which is also a rack and connecting yoke; the provision of shock-absorbing means for advance and return strokes of the hand lever.

Still further objects and aspects of novelty characterizing the invention pertains to details of construction and functional coordination of the component parts of the illustrative embodiment thereof hereinafter described and appearing in view of the annexed drawings in which:

Fig. 1 is a fragmentary side elevation of a permutation and combination machine utilizing the novel hand-lever actuating mechanism;

Fig. 2 is a top plan view of the mechanism shown in Fig. 1;

Fig. 3 is a rear (inside) elevational view of the actuating mechanism unit with parts shown in normal position;

Fig. 4 is a view similar to that of Fig. 3 but showing the parts in operated condition;

Fig. 5 is a perspective view of the lockout and buffer lever provided in the mechanism;

Fig. 6 is a perspective view of the buffer-drive lever provided in the mechanism.

In Fig. 2, the actuating mechanism unit, hereinafter referred to simply as the actuating unit, is generally indicated at **10**; it consists mainly of a pair of mounting plates **11** and **12** disposed in parallel vertical planes and spaced apart by spacing studs **13**, the upper one of which, only, is visible in this view, said stud having been broken away to expose certain other parts; spacing of the mounting plates is also effected in part by a pair of pivot studs **14** and **15** shouldered at their ends.

The aforesaid actuating unit is mounted be-

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tween the parallel side wall plates **16** and **17** of the device with which it is associated, said mounting or base plates **11** and **12** having flanges **18** secured by screws **19** to said side wall plates (see also Fig. 1).

As in Fig. 1, there is provided a hand-lever **20** having its shaft **21** seated mainly in journal **22** carried on the outermost plate **12**, said shaft continuing through the inner plate **11**, as at **21***a*, Fig. 2, for additional bearing support.

One of the important features of the invention is the floating dog and buffer lever **25** shown in Fig. 3; this lever floats, that is, rocks freely, on hand-lever shaft **21** to which it is operatively coupled by a buffer-drive lever **26** fast on said shaft **21** so as to turn with the latter.

The construction of lever **26** provides for two identical stampings **26***a* and **26***b* secured together by rivet means **27** and each having an offset tail portion **28***a* and **28***b* normal to the plane thereof and upon both of the tops of which is spot welded a strap **29**, all of which appears most clearly in Fig. 6.

Among other things, the construction of lever **25**, as seen in Fig. 5, provides for two identical stampings **25***a* and **25***b* spot-welded or otherwise secured together as at **30**, and each having a laterally offset trunnion or yoke member **25***x* and **25***y*, as well as edgewise cut-outs providing a terminal lockout notch **31** and a plurality of arcuately disposed dog teeth **32**.

At the tail of lever **25** is formed a hook portion **33** with an adjoining cut-out **34**, and in the assembled relation of Fig. 3, the lateral offset **28***a* projects sidewise through said cut-out **34** above the nose of hook portion **33** such that a retrograde or clockwise motion (in Fig. 3) of lever **26** causes said offset wing or tail portion **28***a* to bear down on the hook portion and carry lever **25** in the same direction.

As in Fig. 3, lever **25** carries with it a buffer means in the form of a block **35** of resilient material, such as rubber, clamped thereto in a holder bracket **36** secured by screws **37**, which may be tapped into both stampings for additional assembly strength, the lower portion of said block of rubber depending sufficiently to engage the top of the welded strap **29** on the tail wings of lever **26**, such that an advancing or anticlockwise motion of drive lever **26**, in Fig. 3, is communicated upwardly to said rubber block and lever **25** is also urged in an anticlockwise direction.

Secured to the inner side of mounting plate **12**, Fig. 3, is a stopping buffer including a rubber, or like, block **40** clamped in a holding bracket **41**

identical to bracket 36, this stop or buffer being situated to be engaged by the tail or wing portion 28a opposite to portion 28b in Figs. 3 and 4, and projecting through cut-out 34 in lever 25 when the limit of travel in advancing direction (anticlockwise) is reached, there being a companion upper stopping buffer of identical construction mounted on the inner side of the other mounting plate 11, as at 42, Fig. 2, and similarly engaged by wing portion 28b.

The return stroke of the lever system is further buffed by another pair of rubber blocks each mounted on the inner face of one of the base plates 11 or 12, opposite each other, as in the position of the lower block 45 of Figs. 3 and 4, and each engaged by one of the offset tail or wing portions 28a or 28b when the hand lever and associated levers 25 and 26 are returned to normal position.

Another important feature of the invention resides in the lockout and full-stroke dog means provided and consisting of a locking dog lever 48, Fig. 3, and rockably mounted on the stud 14 with a nose portion 49 engageable in the lockout notch 31 as well as the dog teeth 32 on lever 25, said lockout lever being urged by spring 50 normally to project said nose portion in to said notch or teeth; in other words, the locking lever is normally and yieldingly urged in a direction to move into the lockout notch or dog teeth, whichever happens to be in alignment with said nose portion.

However, when the lever system is in normal position, as in Fig. 3, the nose of the locking lever is disposed just below the lockout notch 31 such that, if the handle be turned to advance lever 25 (in Fig. 3), the locking lever nose 49 would drop into notch 31 and arrest such movement, thereby automatically locking the actuating mechanism against effective operation. This contrivance affords part of a means for preventing unauthorized operation of the device in certain applications, or unintended operations where some form of master control is desired.

Means for preventing locking operation of said lockout lever includes a member movable into position relative thereto which prevents displacement thereof by urging means or spring 50 in that direction which will carry the nose 49 into the lockout notch.

For purposes of description, this last-mentioned means may be termed a release means in the sense that its operation, by preventing operative movement of the locking lever 48, releases the lever 25 for operative movement.

It will be observed in Fig. 3 that the normal position of the lockout lever relative to lever 25 is such that the latter may make a slight initial advancing motion before it is locked, that is to say, lever 25 moves slightly in advancing direction to present the lockout notch 31 before nose 49, whereupon spring 50 urges said nose into the notch provided lever 48 is free to turn, which it may do normally.

Projecting from lever 48 is an arm or member 48X extending through cut-out 52 in the side of the apparatus wall 16, Figs. 3 and 4, immediately adjacent the armature 53, Fig. 1, of an electromagnet 54 mounted on the outside of wall 16. Armature 53 is normally urged by its spring 55 out of vertical alignment with said projection 48X of the lockout lever, so as not to obstruct movement of the latter (e. g. clockwise in Fig. 3), and accordingly the lockout lever is free to move into locking position so long as armature 53 remains in said normal position; however, energization of the electromagnet, as by closure of a master control switch 56, Fig. 4, to apply power from battery or source 58 via conductors 59 to said electromagnet, will cause armature 53 to be attracted from normal position to blocking position above projection 48X, as in Fig. 4, such that the lockout lever 48 will not then be permitted to turn into locking engagement with lever 25, and the latter is released or free to turn into fully advanced position, as in Fig. 4.

If the master control circuit is opened at switch 56 before lever 25 is returned, the lockout dog or lever 48 will simply idle over the notch portions 31 without interference to such return.

Means regulating displacements of the lever sytem to full-stroke displacements, includes a dog 60, Fig. 3, pivoted on stud 15 and normally positioned in radial alignment with the axis of lever 25 by a spring 61, such that when the lever 25 is advanced from normal position, the dog 60 will turn into a clockwise position and trail over the dog teeth 32 until notch 31 is positioned therebefore, and upon return motion of lever 25, the dog will be enabled to turn, by virtue of the depth and shape of notch 31, into an anticlockwise position in readiness to trail over the dog teeth during reverse or return motion of lever 25.

However, should the lever system, by manipulation of hand lever 20, be halted in displacement anywhere intermediate the extremes of normal and fully advanced position, the full-stroke dog 60 would jam in the dog teeth 32 by reason of the fact that the thrust between said teeth and the dog 60 would be radial to the latter, so that the stroke of hand lever 20, whether advancing or returning, would have to be completed. By this means, only a full operating stroke will result from any intended or normal operation of hand lever 20.

While means is provided for returning the hand lever 20 to normal position independently of the operator's failure to do so, the invention also provides as another of its features, a means for preventing too rapid or forced a return of said lever by manual displacement, which means will be described hereinafter in conjunction with the power take-off or actuated means which is ultimately operated by manipulation of hand lever 20.

Referring to Fig. 3, there is mounted on the inside of wall 16 a bell crank 64 pivoting on pin 65 in brackets 66 (see also Fig. 2), and one leg of this crank is connected through a universal link 67 to lever 25, the yoke arms 25x and 25y forming a part of the universal connection indicated at 68, there being another universal joint 69 connecting with said bell crank at one end thereof, while the opposite leg of this crank connects through universal joint 70, exteriorly of wall 16, to drive rod 71, as seen also in Figs. 1 and 2.

As in Fig. 2, the horizontal axis pin 69x of joint 69 is projected for attachment with one end of a lever-return spring 72 anchored at its other end to fixed pin 73; this is the normalizing spring means for assuring return of the lever system to normal position after lever 20 has been turned to fully advanced position.

The part ultimately intended to be actuated by the novel hand-lever actuating mechanism is a shaft 75 journaled, in this instance, in machine walls 16 and 17; and to this end, there is provided an impositive driving connection between this main shaft 75 and the actuating unit, particularly the drive rod 71 thereof, said connection

including a universal joint 76 connected to rod 71 and to one leg of a crank lever 77 floating or free on shaft 75, said rod extending into a sleeve 78 connected with universal joint 70, there being a compression spring 79 between joints 70 and 76, on rod 71, such that the driving effort mainly is communicated from joint 70 to joint 76 by said spring to rock lever 77.

Fast on shaft 75 is a trip lever 80 having spring 81 connected to the upper end thereof to restore shaft 75, anticlockwise, to a normal position, while the lower portion of this trip lever is provided with a cammed trip projection 82 engaged by a trip dog 83 on the lower portion of lever 77, such that when the latter is moved clockwise by advance of drive rod 71, the dog 83 bears against trip projection 82 and turns shaft 75 with it far enough for the dog 83 to trip out and pass beneath the cammed portion 82*x*, at which time spring 81 takes over and restores the shaft 75 in an anticlockwise direction.

Means for limiting the rate of return of lever 77 and associated parts includes a reentrant lever 85 having one end 86 pivotally connected to the upper end of lever 77, and its opposite reentrant end 87 connected to the plunger 88 of a conventional dashpot 89, which resists to desired, adjusted, degree the speed with which lever 85, and hence lever 77, may be returned to normal by spring 81.

Of importance in this disclosure is merely the fact that motion is imparted to shaft 75 by action of rod 71 through manipulation of hand-lever 20 and the actuating unit, it being noted herein that the lever means 77—80—82—83 is disclosed and particularly described in another copending application Serial No. 757,370, filed June 27, 1947, now Patent No. 2,579,241.

Allusion was made heretofore to the provision of means for preventing too sudden restorative or normalizing motion of the actuating mechanism following operative advance of rod 71; this means includes a stop rod 90, Fig. 1, pivotally connected at 91 to a lever 92 (dotted lines) fast on shaft 75 and which is advanced, toward the left, as soon as shaft 75 begins to be moved through the aforesaid impositive connection with rod 71, and the free or left-hand end of rod 90 is displaced beneath a tail 60X of the full stroke dog 60, as in Fig. 4, substantially by the time the trip lever 82 is ready to trip out; if at this time an effort is made to force the hand lever 20 too rapidly toward normal position, dog 60 will be prevented from tripping into notch 31 by the presence of rod portion 90 thereunder as in Fig. 4, it requiring a short interval, governed by dashpot 89 for the blocking means or rod 90 to get out of the path, on return stroke, of dog tail 60X. This means prevents any violent manipulation of the hand lever 20 on the return stroke from advanced position.

Summary of operation

Referring to Fig. 1, if an attempt is made to depress the hand-lever 20 without release of the master control means, shaft 21 (Fig. 3) of this lever will not be turned more than a small fraction of its range by reason of the fact that the lockout dog 48 will project its nose 49 into lockout notch 31 on the floating buffer-lockout lever 25, under urgence of spring 50, since there is no holding means in the path of tail portion 48X of this dog.

If, however, the electromagnet control means 54, Figs. 1, and 4 particularly, is energized as a result of actuation of a master control circuit, as by closure of a switch 56, the armature 53 of the electromagnet will be attracted to overlie the tail portion 48X and the lockout dog will not be able to enter notch 31, with the result that the hand lever may be operated, turning shaft 21 anticlockwise, Fig. 3, so that the buffer-drive lever 26 turns with it and transmits its effort to the lockout lever 25 through the buffer blocks 35 at wing portions 28*a*, 28*b*, until the parts assume the fully operated or advanced condition shown in Fig. 4, provided the operator makes a full operative stroke in manipulating said hand-lever 20.

In the event the operator arrests the operating stroke part-way, the full-stroke dog 60 will lock in teeth 32, it being necessary that lockout lever 25 be turned to its limit, as in Fig. 4, in order that the full-stroke dog 60 may enter the notch 31 and pivot past its dead-center to permit the lever 25, and hence handle 20, may be returned toward normal position; however, if the handle or hand-lever 20 be arrested part-way on its return stroke, the full-stroke dog 60 will again jam in teeth 32, preventing a resumption of operative or advancing movement, so that it is necessary to return said hand-lever to normal position to permit dog 60 to pass the lower or endmost of the dog teeth 32, as in Fig. 3, before the handle can again be operated effectively.

As a result of displacement of the driven or buffer-lockout lever 25, motion is transmitted by rod 67, Fig. 3 to crank 64, and hence to universal joint 70 and the heavy spring 79 on rod 71, Fig. 1, with a consequent rocking of floating lever 77, clockwise, thus urging coupling dog 83 against the coupling cam portion 82, whereby lever 80, fast on the main power shaft 75, is coupled to lever 77 and moves with it until the coupling dog 83 trips out on the cam edge 82X, whereupon spring 81 restores lever 80 and shaft 75 to normal position.

If manually released in advanced position, the hand-lever and associated parts will be restored to normal position by spring 72, Fig. 2.

The novel actuating mechanism, shown mainly in Figs. 2 to 4, is a compact unit, adaptable to a variety of applications and usages, whether a linkage means such as 70, 74, 77, 80, be employed or otherwise; the lockout means is simple and highly effective and can be arranged easily for mechanical, as well as electrical control or operation; damage to the lever system, owing to abuse or careless operation is reduced to a minimum owing to the buffer-lever means, and the levers themselves, especially levers 25 and 26 are considered to be of novel form and construction, particularly with respect to their manufacture from assembled stampings to provide yoke members 25X and 25Y, and wing offsets 28*a* and 28*b*, Figs. 5 and 6, together with the cooperating buffer means.

It is the intention that the scope of the invention and improvements originating with this disclosure shall not be limited to the precise details, functional or structural, shown or described, excepting as may be incident to a valid and fair interpretation of the appended claims.

Having thus particularly described and explained my invention as required by Sec. 4888 of the Revised Statutes, the following claims point out and distinctly claim the parts, combinations and aspects of novelty and utility, conformably with said statutes, which are claimed as the invention and discovery originating with this dis-

closure, without intent of being repetitious of the detail of the foregoing specification and description.

I claim:

1. Hand-lever actuating mechanism including a buffer-lockout lever floating on a shaft, a hand lever for turning said shaft, a buffer-drive lever fast on said shaft, operative interlock between said levers including a buffer transmitting effort between said levers at least in one direction of displacement thereof, a lockout dog normally operative to prevent operative motion of said floating lever so long as said dog is free to pivot in a certain direction, and control means for blocking pivoting of said dog in said direction by movement into the path of a part of said dog.

2. Mechanism of the class described and comprising a hand-lever and shaft to be turned thereby, a drive lever on said shaft turning therewith, a floating lever on said shaft, driving interlock between said levers, a pivoted lockout dog for one of said levers and pivotable toward and away therefrom in a radial sense, a lockout notch in said one of the levers into which said dog is yieldingly urged normally to engage and be pivoted by the lever to jam therewith to lock said lever, and a member movable into position in the path of a part of said dog to block pivotal movement of said dog into said notch such that said lever is thereby free to move operatively.

3. Mechanism as defined in claim 2 and further characterized by the provision of a full-stroke dog also cooperative with said one of the levers and dog teeth therein and said lockout notch thereof, such that said lever must be turned fully into opposite limits for each operative displacement thereof from a normal position at one of said limits to an advanced position at the other of said limits.

4. Actuating mechanism of the class described and comprising a pair of mounting plates, means securing said plates in spaced parallel relation, a shaft journaled in said plates, and an operating lever for said shaft; a first lever pivoting freely between its ends on said shaft and including an arcuate portion near one terminus of which is a lockout notch, a hook at the opposite side of said lever from said arcuate portion, a drive lever fast on said shaft and including wing projections extending laterally into said hook whereby turning of said drive lever tends to urge said first lever therewith by interlock of said hook and wing portions, a lockout dog pivotable toward and away from said arcuate portion and into said notch when the latter is disposed opposite thereto, spring means normally urging said dog into said notch, said first lever being normally disposed such that said dog engages said arcuate portion adjacent said notch and said dog must pivot slightly to enter said notch when said lever is moved an amount from said normal position thereof, a member movable from a spring-urged normal position into the path of said dog to prevent motion of the latter into said notch, and electromagnetic means for moving said member into preventing position as aforesaid, and link means for connecting said first lever with a driven means.

5. Mechanism as defined in claim 4 and further characterized by the provision of resilient buffer means carried by said first lever and engaged by said wing projections in one direction of movement, at least, of said drive lever.

6. Mechanism as defined in claim 5 and further characterized by the provision of resilient buffer means on said mounting plates at opposite limits of movement of said drive lever and engaged by said wing projections thereon upon movement thereof into said limits.

7. Mechanism as defined in claim 4 and further characterized by the provision of a full-stroke dog, dog teeth on said arcuate portion terminating at said notch and at an extremity of said arcuate portion, said dog pivoting for release into said notch and at said extremity to permit reversal of travel of said dog and reversal of direction of said first lever.

8. Mechanism as defined in claim 7 and further characterized by the provision of a member movable into blocking relation to said full-stroke dog to prevent release thereof as aforesaid, and time-controlled link mechanism actuated by said actuating mechanism for moving said blocking member into and out of blocking position at predetermined times during operation of said first lever.

9. In an actuating mechanism, an oscillable shaft, a first lever floating on said shaft, a hook near an end of said first lever, a second lever fast on said shaft and having oppositely projecting offset wings, one said wing projecting into and beyond said hook such that said wings lie on opposite sides of the plane of said first lever, a buffer on said first lever engaged by one of said wings in one direction of movement of said second lever, and stationary buffers at opposite limits of travel of said levers and engaged by said wings to resiliently arrest said travel, and means for coupling said levers with driving and driven means.

10. Mechanism as defined in claim 9 and further characterized by the provision of lockout means for one of said levers and including a lockout dog movable toward and away from said one of the levers, spring means moving said dog toward said one of the levers, a lockout formation on said one of the levers and engaged by said dog to lock said lever, said mechanism normally disposed to maintain said one of the levers in a certain position in which said lockout formation is displaced from said dog from which position said dog must move toward said lever to engage said formation, and control means for the dog and including a blocking member movable into and out of blocking position with said dog to permit or prevent movement thereof relative to said lockout formation as aforesaid.

11. In an actuating mechanism of the class described, an operating lever, a shaft rocked by said lever, a driving lever fast on said shaft, a driven lever floating on said shaft in juxtaposition with said driving lever and having a radially situated hook, a lateral projection radially disposed on the driving lever and projecting freely into said hook, a resilient buffer fast on said driven lever in position to be engaged by said lateral projection on movement of the driving lever in a certain direction, whereby to move the driven lever in said direction.

12. In an actuating mechanism comprising: adjacent driving and driven levers on a common shaft, one of said levers floating on said shaft and the other lever fast thereon, one of said levers having a hook formation offset radially of the shaft, and the other lever member having oppositely and axially projecting aligned wings also offset radially of the shaft and disposed adjacent said hook formation with a first one of said wings disposed in said hook formation, a buffer member on one of said levers opposite one

of said wings to be engaged by the latter when the driving lever is turned in a certain direction, and a pair of angularly separated, stationary buffers situated radially of said shaft in a path to be engaged by the second one of said wings when said levers are turned in either direction to opposite limits of travel determined by said stationary buffers.

13. In an actuating mechanism including a driven shaft, lockout means comprising: a member coupled to turn with said shaft and having a lockout tooth situated in an arc disposed radially of said shaft, a lockout dog pivoted to turn in a sense radially into and out of engagement with said tooth, spring means normally urging said dog into a position for engagement with said tooth wherein said dog is slightly pivoted on turning of said member in a certain direction to jam in said tooth, and release means for said dog and including an electromagnet having an armature element movable into and out of two positions one of which is in blocking relation with said dog to block pivotal motion of the latter and thereby disable the dog from pivotal motion sufficient to jam in said tooth, and the other of which positions is in non-blocking relation to said dog, said armature being spring-urged into one of said two positions, and electromagnetically attracted into the other one of said two positions.

14. In an actuating mechanism, a shaft adapted to have a turning force applied manually thereto, a driven lever pivoted freely on said shaft between oppositely and radially projecting arms of the lever, one of said arms having a peripheral arc concentric with said shaft, the remaining said arm having an opening therein situated eccentrically of said shaft, a driving

lever coupled to rotate with said shaft close to said driven lever, said driving lever having at least one interlock projection thereon situated eccentrically of said shaft and projecting in a sense approximately parallel with the axis of said shaft into said opening in the driven shaft so as to couple said levers for joint displacement responsive to application of a turning force to the shaft, a toothed formation on said periphery of the driven lever, and pivoted dog means cooperable with said toothed formation for preventing rotative movement of the driven lever in a certain direction and in a certain pivoted condition of said dog means.

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