

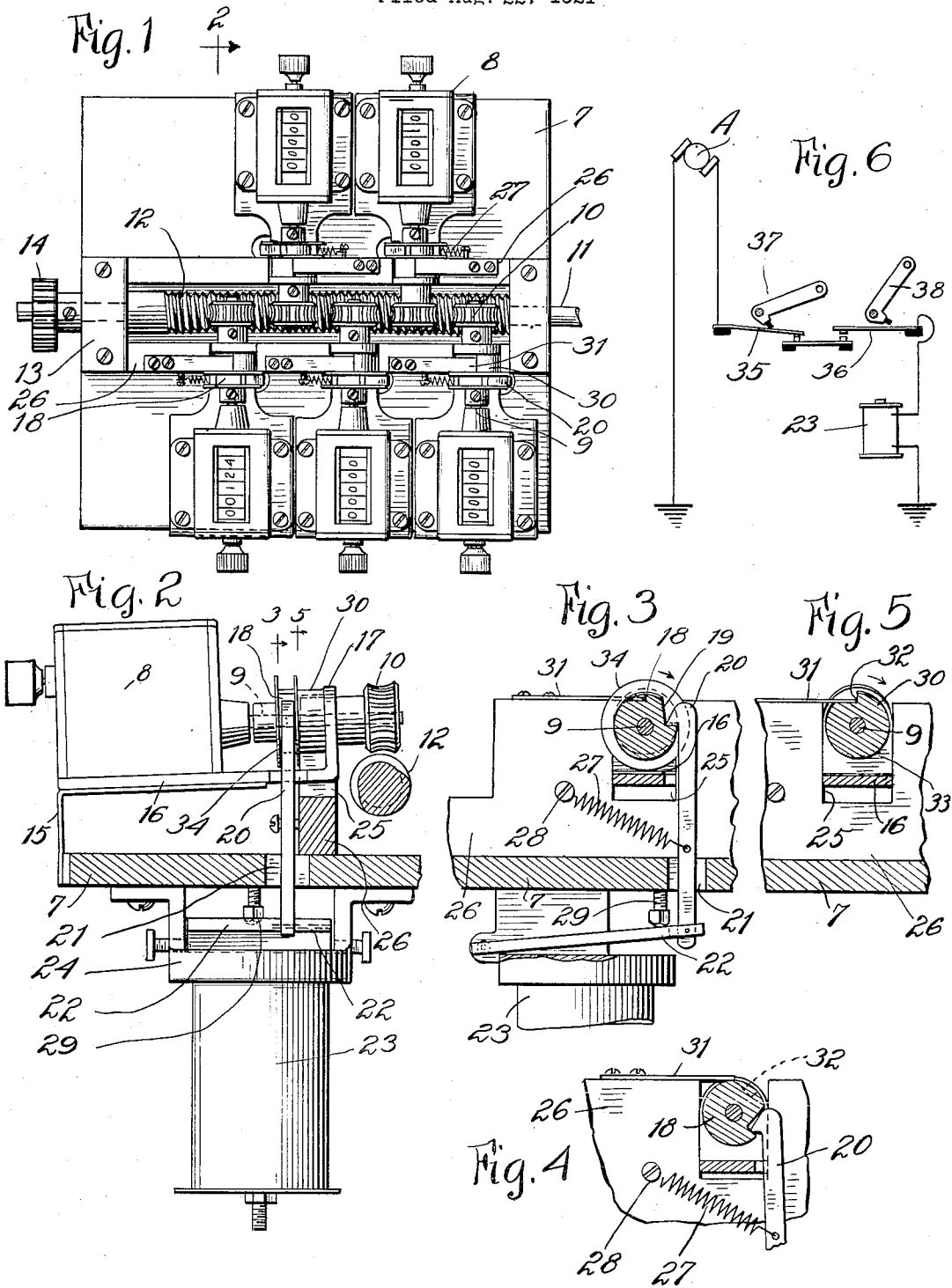
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PRODUCTION METER

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PRODUCTION METER.

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The invention relates to production meters, and has for its aim the provision of means of an improved character for actuating the indicating device or devices under the control of a machine whose production is to be registered.

The invention has more particular reference to actuating means for the counting devices of production meters. Formerly these counting devices have been actuated directly by electro-magnetic means under the control of the machines whose production is being registered, but this method has proven unsatisfactory because of the excessive strain placed upon the counting devices when suddenly thrown into action. Moreover, in the prior devices every impulse action or rotation of the machine is counted, whether or not such action meant production thereby producing very erroneous results.

The principal aim of the present invention is to provide mechanical means of an advantageous character for actuating the counting devices, which means is under the control of electro-magnetic means, the latter in turn being under the control of the machine the production of which is to be indicated so that only productive operations are registered.

The objects of the invention thus generally stated, together with other and ancillary advantages, will be apparent as the description proceeds.

In the accompanying drawings, Figure 1 is a top plan view of a base-plate carrying a plurality of counting devices and having associated therewith a constantly driven actuating shaft. Fig. 2 is a fragmentary transverse sectional view taken in the plane of line 2 of Fig. 1 but on an enlarged scale and showing one of the counting devices and its actuating means. Fig. 3 is a vertical sectional view taken in the plane of line 3 of Fig. 2. Fig. 4 is a somewhat similar view showing the parts after the initial operation. Fig. 5 is a vertical sectional view taken in the plane of line 5 of Fig. 2. Fig. 6 is a diagrammatic view illustrating the electro-magnetic circuit.

As is customary in production meters, the indicating devices are located in the office of the plant or other suitable place usually some distance from the machines whose pro-

duction is to be registered. 7 designates the base-plate carrying said devices. This plate may obviously be of any desired size or capacity. Herein it is shown as having mounted thereon five indicators in the form of counting devices 8 of well known construction. Each of these counting devices has an operating spindle 9 carrying at its free end a worm wheel 10. A shaft 11 having rigid therewith a worm 12 is mounted upon the plate 7 longitudinally thereof, being supported at its opposite ends in suitable bearings 13. This shaft is driven at a relatively high and substantially constant speed in any suitable way, as for instance, by an electric motor (not shown) having a gearing connection with one end of the shaft as at 14.

The various registers or counting devices upon the plate 7, and on opposite sides of the shaft 11, are arranged in staggered relation, as shown clearly in Fig. 1, for the sake of compactness, and each of the devices is mounted upon the plate so as to be capable of movement for the purpose of carrying the worm wheel 10 into mesh with the constantly rotating worm 12. Herein, the devices 8 are yieldingly mounted upon the plate 7 so that the worm wheel is swingable from a normal inoperative position above the worm 12 downward into operative engagement therewith. To this end each of the devices is carried by an angular bracket 15 having an upright portion secured to one side edge of the plate 7 and a horizontal portion upon which the counting device is secured. Between this horizontal portion of the bracket 15 and the bottom of the device 8 is a plate 16 having a laterally projecting portion carrying at its free end an upright arm 17 providing a bearing for the spindle 9. Between this bearing and the register casing, the spindle 9 has fixed thereon a collar 18 having a notch 19 therein (Figs. 3 and 4), which latter forms in effect a tooth adapted to be engaged by the upper end of a dog 20, the lower end of which passes through an aperture 21 in the base-plate 7 and is connected to a hinged member 22 constituting the armature of an electro-magnet 23. The latter is supported beneath the base-plate 7 by means of a bracket 24.

When the electro-magnet 23 is energized, the armature 22 is drawn downwardly, and

the dog 20 engaging in the notch 19 of the collar 18 imparts an initial rotary movement to the spindle 9 in a clockwise direction (Fig. 3). At the same time the spindle and with it the worm wheel 10, is drawn downwardly into engagement with the worm 12, the bracket 15 being adapted to yield for this purpose. In this movement the spindle is guided by the arm 17 slidably engaging with the side walls of a notch 25 formed in an upright longitudinally extending rail or bar 26 secured at its opposite ends upon the board 7 and extending substantially throughout the length of the latter. One bar 26 is provided for each row of counting devices 8 on opposite sides of the intermediate actuating shaft 11. A coiled tension spring 27 acting between the dog 20 and a stud 28 on the bar 26, serves to draw the dog into engagement with the notched collar 18 and at the same time to draw the dog and thereby the armature 22 upwardly until the latter is stopped by a stop pin 29 screw-threaded into the under side of the base-plate 7.

When the worm wheel 10 has been thus initially moved into mesh with the worm 12, means is brought into operation for positively holding the gear elements in mesh until the register spindle has moved through a definite arc of movement, herein one complete revolution. This is accomplished by means of a cam disk 30 (Fig. 5) which is fixed upon the spindle 9 between the arm 17 and the notched collar 18. With this cam wheel 30, a finger 31 fixed upon the upper edge of the rail 26 is adapted to coact. Thus, referring to Fig. 5 it will be seen that the cam wheel 30 has a notch 32 therein, into which the free end of the finger 31 engages when the spindle is in its uppermost position, and the gear elements 10 and 12 are out of mesh. As soon as the spindle 9 is given its initial rotation as it is drawn downwardly upon the energization of the electro-magnet 23, as above set forth, the finger 31 engages with the dwell 33 of the cam disk and positively holds the spindle in its lowermost position, in which the gear elements are in mesh. Immediately upon the completion of a revolution of the spindle 9, the finger engaging in the notch 32 of the cam disk permits the latter and thereby the spindle to rise under the spring action of the bracket so as to withdraw the worm wheel 10 from intermeshing engagement with the worm 12 and thus to effect the stoppage of the spindle. When the spindle is thus brought to rest, the collar 18 thereon is so positioned as to permit the upper end of the dog 20 to be drawn by the spring 27 into the notch 19, ready for the next operation.

It will be apparent that the cam disk 30 bears a fixed relation to the spindle 9 of

the counting device and that therefore the means for maintaining the counting device in operative association with the drive shaft is in effect controlled by the counting device. When said device has operated through one complete cycle of operation it becomes disconnected from the drive shaft and so remains until the next energization of the electromagnet 23 by the shop machine. The speed therefore at which the shaft 11 is driven is immaterial so long as it is greater than that of the speed of the machine whose production it registers. If it should happen that more than one energization of the magnet should be brought about either accidentally or intentionally by the operator, the counting device nevertheless will be operated through one cycle of operation only for each complete operation of the machine.

While in the present instance each cycle of operation of the counting device is equal to one complete revolution of the spindle 9, the extent of travel of the spindle necessary to effect the complete cycle of operation may vary. Thus in cases where the counting device is called upon to register the operations of a machine occurring in rapid succession, the arrangement may be such that a partial revolution only of the spindle will be necessary to effect each cycle of operation. In this event, it will be obvious, the spindle may be moved into and out of mesh with the driving shaft with greater frequency simply by increasing proportionately the number of notches 19 and 32 in the collars 18 and 30.

For the purpose of guiding the upper end of the dog 20 in its up and down movement, the notched collar 18 may be provided upon opposite sides with a pair of disks 34 (Fig. 2).

Referring now to Fig. 6: It is obvious that the counting devices must, in order to accurately register the number of productions of the machine, be actuated only when the machine actually accomplishes the work intended. The electric circuit therefore which is automatically closed in each operation of the machine must be otherwise interrupted in the event of the failure of the machine to properly function. This circuit, therefore, includes, with the generator A and the electro-magnet 23, a pair of switches 35 and 36. The former is normally closed and operable to open the circuit by suitable means such as a lever 37 under the control of the operator; and the latter is normally open and operated automatically in the operation of the machine to close the circuit once for each cycle of operation thereof. For this latter purpose, a suitable actuating lever 38 operatively associated with the machine is provided. By this arrangement it will be seen that normally each operation of the machine will effect the

energization of the electro-magnet 23, through the operation of the lever 38. If, however, the machine for some reason fails to properly function, the operator actuates the lever 37, as by operating with his foot or the like a push button (not shown), actuates the lever 37 to open the switch 35. The closing of the switch 36 therefore is rendered ineffective to energize the electro-magnet 23.

It will be seen that I have produced a means for actuating indicating devices such as counters for production meters, which is of a very practical character. The energization of the electro-magnets for a very brief period is sufficient to throw the gear elements of the devices and the constantly driven gear element into operative engagement, and such operative engagement is limited in the rotation of the counting devices themselves exactly to a complete operating cycle of said devices. Moreover, this operation takes place mechanically and hence positively, and with a degree of smoothness impossible of attainment in the case of prior devices in which the force of the electro-magnets alone is depended upon for the operation of the counters.

While I have herein illustrated and described the invention with considerable particularity, it will be understood that it is contemplated that various changes in construction and arrangement may be made by those skilled in the art, without departing from the spirit and scope of the invention as expressed in the appended claims.

I claim as my invention:

1. A means for counting the operations of a machine comprising, in combination with a part of such machine movable in the operation thereof, one for each productive operation, of a counting device, a drive shaft constantly rotated, and electro-magnetic means including an electric circuit controlled by said part in the operation of the machine and adapted to effect an operative association between the counting device and said shaft, and means independent of said circuit for rendering the counting device inoperative upon the completion of a cycle of operation thereof.

2. A means for counting the operations of a machine comprising, in combination with a part of such machine movable in the operation thereof, of a counting device, a drive shaft constantly rotated, electromagnetic means controlled by said part in the operation of the machine and adapted to effect an operative association between the counting device and said shaft, and means operating as an incident to such association of the counting device with the shaft for maintaining such operative association.

3. A means for counting the operations of a machine comprising, in combination with

a part of such machine movable in the operation thereof, of a counting device, a drive shaft constantly rotated, electromagnetic means controlled by said part in the operation of the machine and adapted to effect an operative association between the counting device and said shaft, and means for maintaining such operative association, said last mentioned means being adapted to permit the disassociation of the counting device and shaft after the completion of one cycle of operation of the counting device.

4. The combination of a shaft driven at a substantially constant and relatively high speed, an indicating device having an operating spindle and a worm wheel fixed thereon, said shaft having a worm rigid therewith with which said wheel is adapted to mesh, means for moving said wheel into mesh with the worm, and cam means for maintaining the wheel and worm in mesh for a period of predetermined duration.

5. The combination of a shaft driven constantly at a relatively high rate of speed, a counting device having an operating spindle, said shaft having a worm rigid therewith and said spindle having a worm wheel adapted to mesh with said worm, electromagnetic means for moving the worm wheel into engagement with said worm, and means for preventing the disassociation of the wheel from the worm until the counting device has moved through a complete cycle of operation.

6. The combination with a counting device having an operating member movable through a predetermined arc of travel once for each registering operation of the device, of a constantly driven shaft, electromagnetic means operable to effect the operative association of said operating member with said shaft, said means including an electric circuit having a switch therein for opening and closing the circuit, and means adapted to hold said operating member and shaft in operative association and effect the disassociation of the parts when a complete cycle of operation of the device has been effected, said holding means being independent of said switch.

7. The combination of a constantly driven gear element, an indicating device having an operating gear element normally out of mesh with the first mentioned gear element, an electromagnet, means operable upon the energization of such magnet to initially operate the indicating device and simultaneously move said gear elements into inter-engagement, and mechanically operating means for positively holding said gear elements in engagement, said means being adapted to effect the disengagement of said gear elements after said device has operated to a predetermined extent.

8. The combination of a constantly driven

gear element, an indicating device having an operating spindle with a second gear element thereon normally held out of mesh with the first element, a member fixed upon said spindle, and a reciprocable dog adapted to engage with said member to effect the interengagement of said gear elements while imparting a rotary movement to said spindle.

9. The combination of a constantly driven gear element, an indicating device having an operating spindle with a second gear element thereon normally held out of mesh with the first element, a notched member fixed upon said spindle, a reciprocable dog adapted to engage with said member to effect the interengagement of said gear elements while imparting a rotary movement to said spindle, and means operable to hold said gear elements in interengagement while the spindle rotates through a predetermined arc of movement.

10. The combination of a constantly driven gear element, an indicating device having an operating spindle with a second gear element thereon normally held out of mesh with the first element, a member fixed upon said spindle, and a reciprocable dog adapted to engage with said member to effect the interengagement of said gear elements while imparting a rotary movement to said spindle, and means operable to hold said gear elements in interengagement while the spindle rotates through a predetermined arc of movement, the last mentioned means comprising a cam member fixed upon the spindle and stationary part adapted to coact with said cam member normally to permit of the disengagement of the gear elements but operable upon the initial rotation of the spindle to hold the gear elements in interengagement.

11. In a production register, the combination of a base plate, an indicating device, a shaft mounted upon the base plate and adapted to be constantly driven, an operating spindle for said device, a pair of gear elements on said shaft and spindle respectively normally disengaged, a member fixed upon said spindle, a dog normally engaging said member electro-magnetic means for actuating said dog whereby to initially rotate the spindle while drawing it downward to carry its gear element into engagement with the other gear element, and means for holding the gear elements in interengagement during intervals of predetermined duration.

12. The combination called for by claim 11 in which the means for holding the gear elements in operative association comprises a cam member upon the spindle and a stationary part coacting with said cam member.

13. The combination in a production meter, of a base plate, an indicating device, a constantly driven shaft on said plate, an

operating spindle for said device, a pair of gear elements on said spindle and shaft respectively, means operable to impart an initial rotation to said spindle while moving its gear element into engagement with the other gear element, and means for holding said gear elements in interengagement including a cam member upon the spindle, and a stationary part coacting with the cam member so as to permit at a predetermined point the disengagement of the gear elements.

14. In a production meter, the combination of a base plate, an indicating device having an operating spindle, a constantly driven gear element, a second gear element on said spindle normally disengaged from the first gear element, means yieldingly supporting said indicating device upon the base plate to permit of the swinging movement of said spindle to carry its gear element into interengagement with the other gear element, and means for causing such interengagement of the gear elements for periods of limited duration.

15. In an apparatus for measuring the productive capacity of a shop machine, the combination with a part of such machine movable in the operation thereof, of an indicating device having an operating member, a shaft driven constantly at a relatively high speed, and electromagnetic means controlled by said part for moving said operating member into and out of operative association with the shaft.

16. A means for counting the operations of a machine comprising, in combination with a part of such machine movable in the operation thereof, of an indicating device having an operating member, a shaft driven constantly at a relatively high speed, and electromagnetic means controlled by said part in its movements for effecting the operative association of said operating member with said shaft, said means being adapted to effect the initial rotation of the operating member in the act of effecting such association thereof with the shaft.

17. A means for indicating the productive capacity of a tool or other machine, comprising, in combination with a switch arranged to be actuated in each productive operation only of the machine, a constantly driven shaft, an indicating device, electromagnetic means controlled by said switch for effecting a connection between said device and said shaft once for each productive operation of the machine, and means for maintaining such connection permitting disconnection only upon the completion of a cycle of operation by the indicating device.

18. A means for indicating the productive capacity of a machine comprising, in combination, a drive element rotating at a substantially constant and relatively high speed, an

indicating device, and electromagnetic means operable to move said device bodily to effect a driving connection between it and said element.

19. A means for counting the productive operations of a machine having, in combination, a drive shaft, an indicating device yieldably supported and having an operating member, and electromagnetic means for moving said device as permitted by its support whereby to effect a driving connection between its operating member and said shaft.

20. The combination of a drive element rotating at a substantially constant speed, an indicating device having an element to be driven, means yieldably supporting said device with its element normally out of operative association with the drive element, and means including an electromagnet having a device adapted to engage said indicating device whereby to move the latter to effect a driving connection between said driven element and said drive element.

21. The combination of a drive shaft rotating at a substantially constant speed, an indicating device having a spindle, a pair of gear elements on said shaft and spindle respectively adapted to intermesh, means yieldably supporting the indicating device, and means for moving said device to carry said gear elements into mesh, the last mentioned means including a collar fast on said spindle and providing a tooth, and a reciprocatory member adapted to engage said tooth.

22. The combination of a drive shaft, an indicating device having a spindle, a pair of gear elements on said shaft and spindle respectively adapted to intermesh, means on said spindle providing a pair of notches spaced apart a distance substantially equal to the arc of travel of the indicating device in effecting a complete cycle of operation, means engaging in one of said notches to move the gear elements into mesh, and means adapted to engage in the other one of said notches and to hold the gear elements in mesh, the last mentioned means being adapted when entered in its said notch to permit the spindle to move out of driving connection with the shaft.

23. The combination of a drive shaft, an indicating device, means for moving the indicating device into driving connection with the drive shaft including a toothed

member on the device, a reciprocatory finger adapted to engage with said toothed member, and electromagnetic means for reciprocating said finger.

24. The combination with an indicating device having an operating element, a drive element, and means for effecting a driving connection between said operating element of the device and said drive element including a disk fast upon the operating member, a hook member adapted to engage with said collar, and electromagnetic means for actuating said hook member whereby to rotate said collar and thereby said indicating device.

25. The combination with an indicating device having an operating element, a drive element, and means for effecting a driving connection between said operating element of the device and said drive element including a disk fast upon the operating member, a hook member adapted to engage with said disk, and electromagnetic means for actuating said hook member whereby to rotate said disk and thereby said indicating device, said indicating device being yieldingly mounted whereby its operating member is moved into driving association with said drive shaft in the reciprocation of said hook member.

26. The combination of a drive shaft, an indicating device, means operable to effect a driving connection between said indicating device and said shaft, and cam means for maintaining such connection effective while the indicating device operates through a predetermined range of movement.

27. The combination of a drive shaft, an indicating device, means operable to effect a driving connection between said indicating device and said shaft, and cam means for maintaining such connection effective while the indicating device operates through a predetermined range of movement, said cam means including a disk rotatable in the operation of said device and having a notch in its periphery and a finger adapted to engage with the periphery of said disk and arranged to enter into the notch therein to permit relative movement between the indicating device and said shaft.

In testimony whereof, I have hereunto set my hand.

PETER A. COONEY.