F. P. CLEVELAND.

OPERATING MECHANISM FOR PAPER TESTING MACHINES.

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1,025,110. Patented Apr. 30, 1912.

Fig. 1.

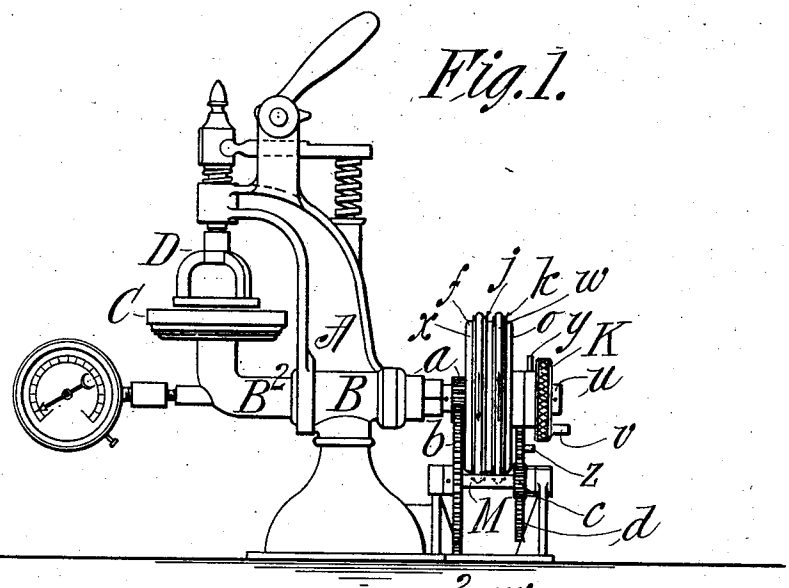


Fig. 3.

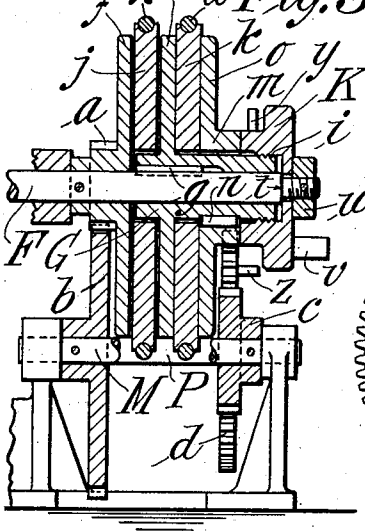
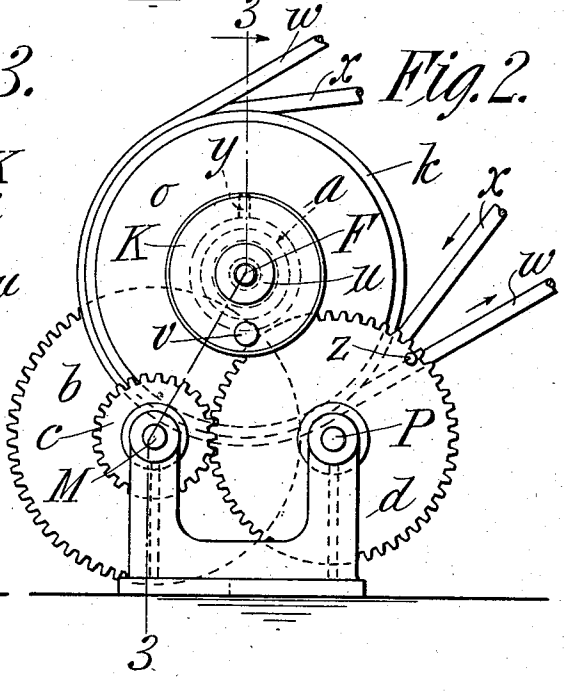


Fig. 2.



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OPERATING MECHANISM FOR PAPER-TESTING MACHINES.

1,025,110. Specification of Letters Patent. Patented Apr. 30, 1912.

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To all whom it may concern:

Be it known that I, FRED P. CLEVELAND, a citizen of the United States of America, and resident of Holyoke, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Operating Mechanism for Paper-Testing Machines, of which the following is a full, clear, and exact description.

This invention relates to improvements in machines for testing the strength of paper, and other sheet material, and more particularly to machines of the kind known in the trade as the "Mullen tester" and substantially such as is illustrated and described in Letters Patent of the United States issued to John W. Mullen, under Number 358,056.

Paper testing machines of the type indicated include a platform on which the paper is supported and clamped and which platform is made with an opening covered by an elastic diaphragm, which opening is in communication with the liquid chamber in the frame or body of the machine below the platform and in which chamber a piston or plunger is operable for the displacement of the liquid and the distention of the diaphragm to cause a breaking of the paper, the breaking pressure being recorded on a pressure gage or indicator; and for the endwise movements of the piston or plunger an operating shaft is employed which is rotative in fixed bearings, which has a screw engagement with the piston, and which shaft is provided with a hand wheel for the turning thereof. And inasmuch as a considerable number of rotations of the hand wheel are necessary to force the piston forward to an extent variously required to cause the breaking of the more or less strong paper and to also return the piston to its normal position after each testing operation, it has become desirable to provide means for mechanically rotating the operating shaft of the machine especially where a large number of tests are to be made in succession; and my invention particularly resides in means of comparatively simple and inexpensive character for causing a rotative propulsion of the operating shaft in its working direction to an extent ample to secure the rupture of the paper and to automatically cause a discontinuance of such rotative propulsion to be followed by a reversed rotary movement of the shaft so as to restore the piston to its normal position.

The invention is particularly described in conjunction with the accompanying drawings and is set forth in the claims.

In the drawings:—Figure 1 is a side elevation of a Mullen tester in which my improvements are embodied. Fig. 2 is an elevation of the operating and controlling means for the working shaft of the tester, on a larger scale, and as seen at the right hand end of Fig. 1. Fig. 3 is a vertical sectional view as taken more or less nearly on the line 3—3, Fig. 2.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents the stand or frame of the tester, the portions B and B^2 of which are understood as cylindrical and hollow,—the portion B^2 being upturned and terminating in the platform C on which the paper is to be held by the clamping foot D while being tested; and the piston (not shown) understood as working in the hollow cylindrical body is operated, through screw engagement therewith, by the shaft F, which is herein termed the rotative operating shaft of the testing machine. This shaft F at its outer end portion has a small gear wheel *a* and a fixed flange *f* affixed thereon. Endwise outwardly beyond said parts *a* and *f* is a sleeve G which by being spline engaged with the shaft is capable of an endwise movement relatively to the shaft but is necessarily revoluble with the latter.

g, Fig. 3, represents the spline making the aforestated engagement.

The sleeve G has at an intermediate part thereof, but nearer its inner than its outer end, an outwardly projecting flange *h* similar to the aforementioned flange *f*. The sleeve, moreover, at its outer end portion has the external screw threads *i*.

j represents a pulley loosely revoluble about the sleeve between one side of the sleeve flange *h* and the shaft flange *f*; and another pulley *k* is loosely revoluble about the sleeve at the other or outer side of the flange thereof.

m represents an annular member which by spline *n* is engaged with and endwise rotative as one with the sleeve, this part having as an outward continuation thereof a flat faced flange *o* similar to the aforemen-

tioned flanges *h* and *f*, and having its location adjacent the outer face of the second named pulley *k*.

The flange *f* herein termed the "shaft flange," the one *h*, herein termed the "sleeve flange," and the flange *o* may be regarded as clutch members, a given two thereof being operative at certain times to confine one of the pulleys between them, while another given two of such flanges are operative at another time to confine the other pulley between them.

K represents a member made with internal screw threads in engagement with the threaded sleeve G. This, as shown in the drawings, is in the form of a ring nut, free to rotate relatively to the shaft but held against endwise movement relatively to the shaft by having an engagement with the shoulder *t* at the end of the shaft and being engaged by the confining nut *u*. The flange portion of this ring nut is peripherally knurled, as represented in Fig. 1, so that it may be conveniently turned by thumb and finger, and the ring nut, moreover, has a crank like extension *v* to be employed as a crank for the turning thereof.

The wheels *j* and *k* here represented as grooved pulleys are simultaneously driven, the one in one direction by an open belt *w*, and the other in the opposite direction by a cross belt *x*, both of which may be run from the same source of power.

If the ring nut K is turned around for part of a rotation in one direction, it will cause an outward endwise drawing of the sleeve so that the pulley *k* will be clamped or clutched between the flanges *h* and *o*, and through the frictional engagement or bind the pulley *k* turning in a given direction will cause the parts *h*, G, *o* and *m* to be correspondingly turned, and with them the rotative operating shaft of the paper testing machine in the same direction; and when the parts are in the condition last stated, it may be understood that the rotation of the shaft F will be such as to cause the liquid compressing action of the piston in the paper testing machine. By loosening the ring nut, the middle one *h* of the three clutch flanges may have a neutral position, that is one loose and free relatively to both of the pulleys; and by sufficiently turning the ring nut in the proper direction, the other pulley J may be held clutched to the sleeve flange *h*, and the shaft flange *f* so that a reversed rotary movement of the shaft will be imparted to the latter for restoring the piston to its normal position in the paper tester, whereupon the liquid therein will be relieved from pressure and displacement.

While the mechanism above described is efficient and of utility even when the ring nut is manually operated, means for the automatic control of such ring nut are provided and will be pointed out as follows:— The ring nut is provided with an eccentrically located or radial stud *y;* M represents a countershaft having a comparatively large gear wheel *b* affixed thereon which is in mesh with the aforementioned shaft gear wheel or pinion *a;* and this countershaft has another small gear wheel or pinion *c* thereon; P represents another countershaft having a comparatively large gear wheel *d* affixed thereon which is meshed by the gear wheel *c* of the first countershaft, and which gear wheel P is provided with an eccentrically located stud *z* revoluble in a path which is intersected by the stud *y* of the ring nut K.

Now assuming that the parts are in the relations shown in Fig. 3 and the rotative operating shaft F of the paper testing machine is being rotated in its working direction, after, for example, 9 or 10 rotations of such shaft, which is ample to force the piston for a maximum of the liquid displacement in the tester, the gear wheel *d* will through the driving connection therewith of the other gears *a*, *b* and *c*, be so rotated as to bring the stud *z* around to engagement with the stud *y* of the ring nut (which, as is understood, moves as one with the rotating tester operating shaft and the sleeve G), resulting in the causing of such a turning of the ring nut relatively to the sleeve as to endwise shift the sleeve to unclutch the wheel *k*, and under the momentum of the driving connections to cause a clutching of the other pulley *j* so that the shaft will be reversely rotated for the restoration of the plunger to its normal pressure relieving position.

I claim:—

1. The combination with the rotative operating shaft having a clutch member affixed thereon, of a sleeve longitudinally movable but non-rotative relatively to the shaft and formed with screw threads, and also provided with a clutch member, a member made with screw threads in engagement with the threaded sleeve, and rotative, but axially immovable, relatively to the shaft, an annular clutch member adjacent said screw threaded member, surrounding, and endwise movable on, but non-rotative relatively to the sleeve, a pulley revolubly movable about the sleeve and having its faces in close relation to the clutch member of the shaft and the clutch member of the sleeve, and another pulley between the sleeve clutch member and the sleeve-surrounding clutch member, and means for revolubly driving the pulleys simultaneously in reverse directions.

2. The combination with a rotative operating shaft having a fixed flange thereon, a sleeve splined on and capable of endwise

movement relatively to, the sleeve having a flange at an intermediate portion thereof and provided at its outer end portion with external screw threads, a pulley loosely revoluble about the sleeve between one side of the flange thereof and the shaft flange, another pulley loosely revoluble about the sleeve at the other side of the flange thereof, an annular member spline engaged with, and endwise movable relatively to, the sleeve having a flange adjacent the second named pulley, a rotatively operable ring nut constrained against axial movement relatively to the shaft and having a screw engagement with the threaded portion of the sleeve, and means for revolubly driving the pulleys in reverse directions.

3. The combination with the rotative operating shaft having a clutch member affixed thereon, of a sleeve longitudinally movable but non-rotative relatively to the shaft and formed with screw threads, and also provided with a clutch member, a member made with screw threads in engagement with the threaded sleeve, and rotative but axially immovable relatively to the shaft, an annular clutch member adjacent said screw threaded member surrounding, and endwise movable on, but non-rotative relatively to the sleeve, a pulley revolubly movable about the sleeve and having its faces in close relation to the clutch member of the shaft and the clutch member of the sleeve, and another pulley between the sleeve clutch member and the sleeve-surrounding clutch member, means for revolubly driving the pulleys simultaneously in reverse directions, and means operated by the shaft, and operative upon the screw threaded member, for rotatively moving the latter and thereby endwise shifting the sleeve, after rotations in a given direction of the shaft.

4. The combination with the rotative operating shaft having a clutch member affixed thereon, and provided with a gear wheel, of a sleeve longitudinally movable but non-rotative relatively to the shaft and formed with screw threads, and also provided with a clutch member, a member made with screw threads in engagement with the threaded sleeve, and rotative but axially immovable relatively to the shaft, and provided with an eccentrically located projection, an annular clutch member adjacent said screw threaded member, surrounding, and endwise movable on, but non-rotative relatively to the sleeve, a pulley revolubly movable about the sleeve and having its faces in close relation to the clutch member of the shaft and the clutch member of the sleeve, another pulley between the sleeve clutch member and the sleeve-surrounding clutch member, means for revolubly driving the pulleys simultaneously in reverse directions, a revolubly mounted gear wheel having an eccentrically located projection revoluble in a path intersecting the location of the projection of the aforesaid screw threaded member, and intermediate gearing between said shaft gear and said projection provided gear.

5. The combination with a rotative operating shaft having a gear wheel and a fixed flange thereon, a sleeve, splined on, and capable of endwise movement relatively to, the shaft, having a flange at an intermediate portion thereof and provided at its outer end portion with external screw threads, a pulley loosely revoluble about the sleeve between one side of the flange thereof and the shaft flange, another pulley loosely revoluble about the sleeve at the other side of the flange thereof, an annular member spline engaged with, and endwise movable relatively to, the sleeve having a flange adjacent the second named pulley, a rotatively operable ring nut, constrained against axial movement relatively to the shaft having a screw engagement with the threaded portion of the sleeve, and provided with an eccentrically located stud, means for revolubly driving the pulleys in reverse directions, a countershaft, a gear wheel thereon in mesh with the aforesaid shaft gear and another smaller gear wheel thereon, and a second countershaft having a gear wheel thereon which is meshed by the smaller gear wheel of the first countershaft and which is provided with an eccentrically located stud revoluble in a path intersected by the stud of the ring nut.

Signed by me at Holyoke, Mass., in presence of two subscribing witnesses.

FRED P. CLEVELAND.

Witnesses:
WM. H. BOND,
C. E. POPE.