(No Model.) 3 Sheets—Sheet 1.

E. MORRISON & J. P. HERRON.

FABRIC TESTING MACHINE.

No. 422,145. Patented Feb. 25, 1890.

Fig. 1.

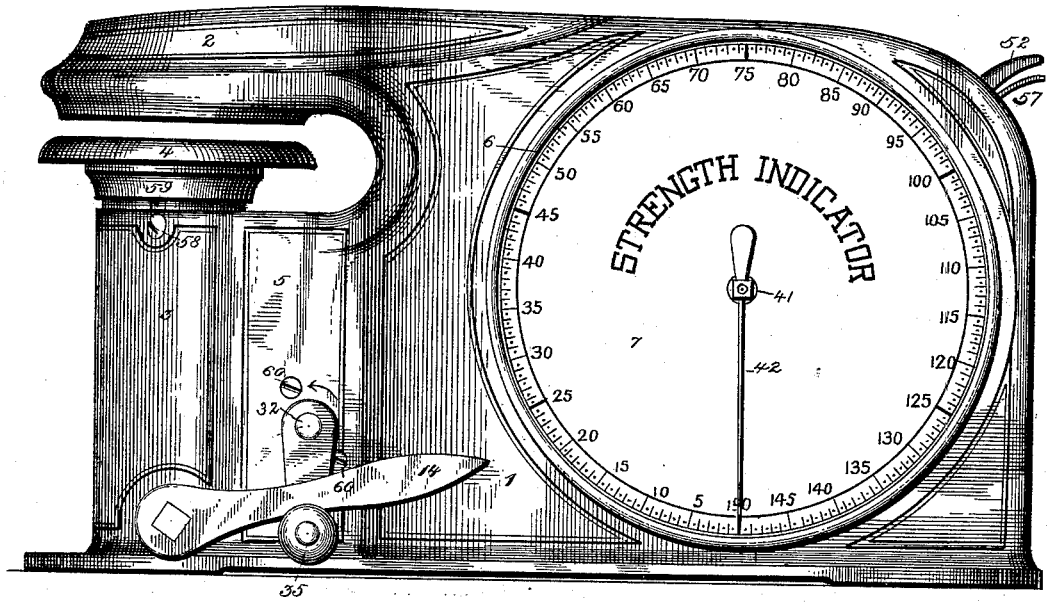


Fig. 4.

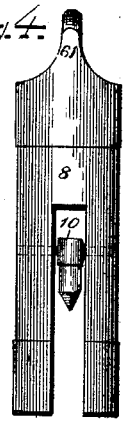


Fig. 5.

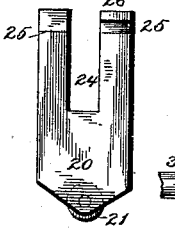


Fig. 6.

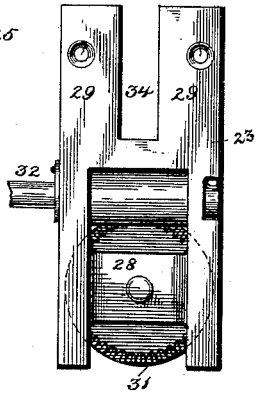


Fig. 7.

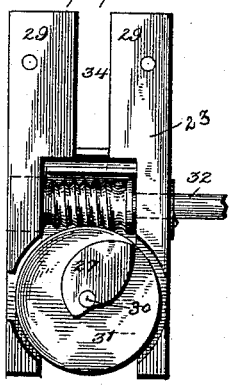
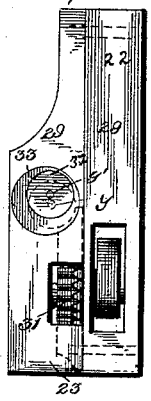


Fig. 8.



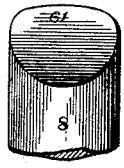


Fig. 9.

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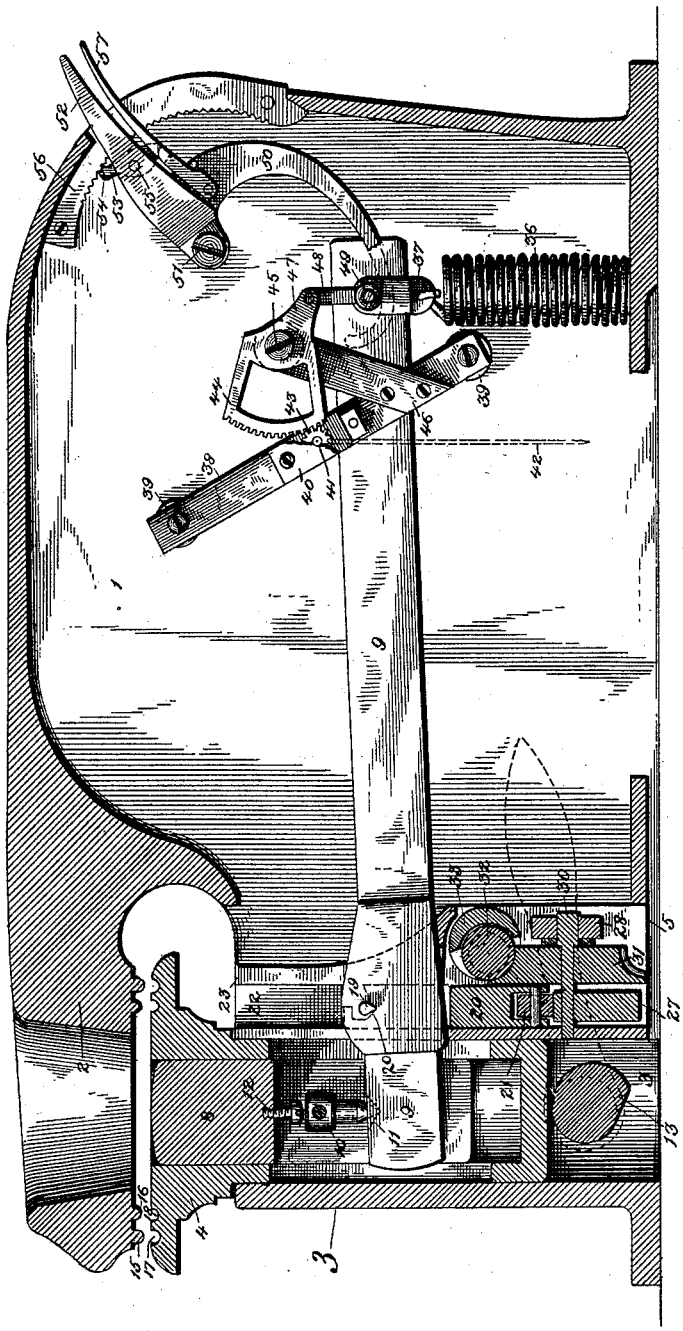
(No Model.) 3 Sheets—Sheet 2.

E. MORRISON & J. P. HERRON.

FABRIC TESTING MACHINE.

No. 422,145. Patented Feb. 25, 1890.

Fig. 2.



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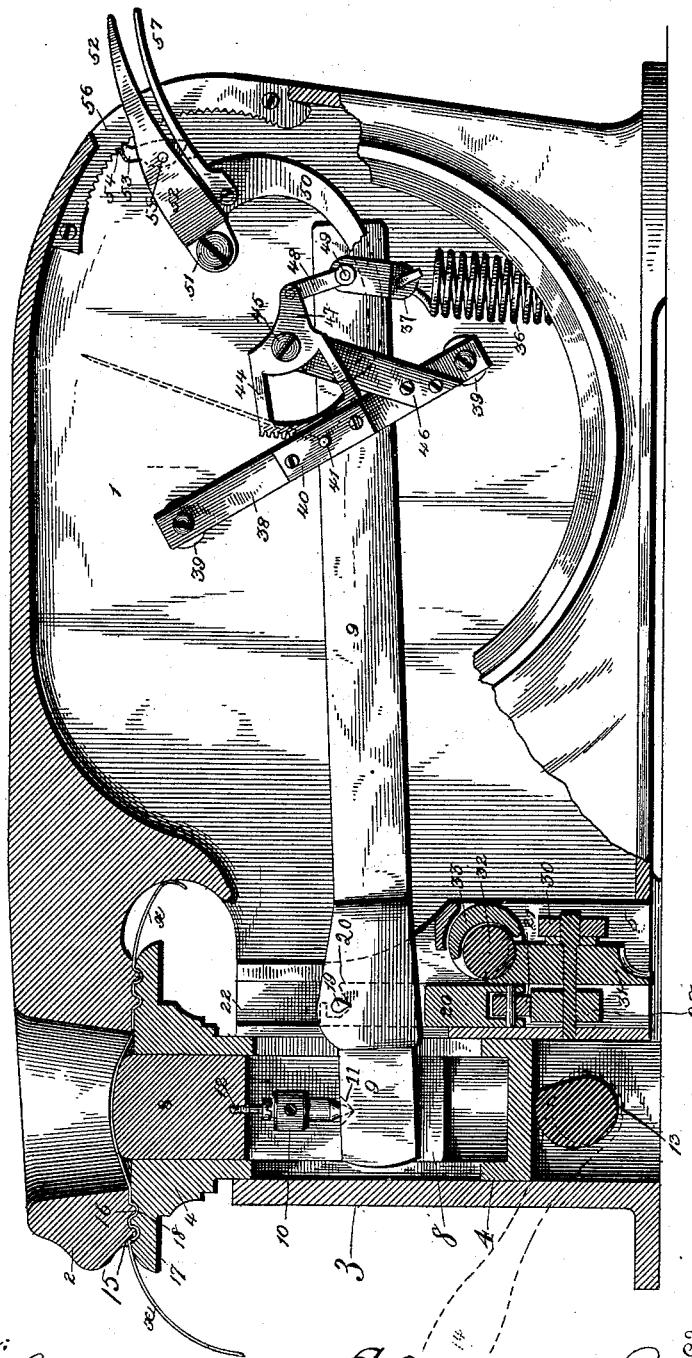
FABRIC TESTING MACHINE.

No. 422,145. Patented Feb. 25, 1890.

Fig. 2.



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UNITED STATES PATENT OFFICE.

EBENEZER MORRISON AND JAMES P. HERRON, OF WASHINGTON, DISTRICT OF COLUMBIA.

FABRIC-TESTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 422,145, dated February 25, 1890.

Application filed April 3, 1888. Serial No. 269,457. (No model.)

To all whom it may concern:

Be it known that we, EBENEZER MORRISON and JAMES P. HERRON, citizens of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Fabric-Testing Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention has relation to machines for testing the strength of fabrics, it being an improvement upon United States Patent No. 292,130, granted us January 15, 1884, and adapted to practice the step and method of testing fabrics disclosed and secured to us by said patent.

Among the objects of this invention are to provide a construction of mechanism for applying pressure against the fabric to be tested in such a manner as to follow, take up, and compensate or neutralize the stretching of the fabric; to provide a means for applying the pressure, which shall be to a greater degree than heretofore, independent of and less liable to be varied in its effect by the act of the user; to provide means for indicating the amount of pressure applied or the strength of the material tested, which means shall remain unaffected by the termination of the resistance to the pressure applied at the instant that the fabric is ruptured.

Other objects and advantages of the invention will hereinafter appear, and the novel features thereof will be particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a side elevation of a testing-machine constructed in accordance with our invention. Fig. 2 is a vertical longitudinal section, the parts being in the position they occupy when the machine is at rest. Fig. 3 is a similar section, the parts being in the position they occupy when the machine is at work; and Fig. 4 is a detail of the plunger and annexed supporting-pin. Fig. 5 is a detail of the movable fulcrum-support and friction-wheel. Fig. 6 is a side view (looking from right to left in Fig. 2) of the fulcrum-support case, showing the bevel-wheel and masked in worm-gear. Fig. 7 is a view of the same from the opposite side with the fulcrum-support removed and showing the lifting-cam. Fig. 8 is a back view of the same matter as Fig. 7. Fig. 9 is a front view of the bearing-surface of the plunger shown in Fig. 4.

Like numerals of reference indicate like parts in all the figures of the drawings.

In the use of the scale-beam shown in our previous patent experience has shown that an operator by too suddenly sliding the counterpoise or weight along the beam can vary to a limited extent the indications of the strength of the fabric being tested; so, also, by moving the weight very slowly along the beam the indicated strength may be made greater to a limited extent, so that it has been found desirable to provide means for applying pressure which shall not be so much under the control of the operator, in order that the indications and results of a series of tests shall be more uniform.

1 represents the case for the operative parts of the machine, and it is in this instance formed in a single casting and has a rigid clamping-jaw 2 and a cylinder 3 for the reception of the cylindrical movable jaw 4, and a chamber 5 for the reception of a movable fulcrum and the mechanism employed in connection therewith. The face of the case has a circular opening 6 to receive the dial 7, on which is the scale indicating pounds extending, as desired, in this instance from "0" to "150."

Within the cylindrical jaw 4 is the plunger 8, which is that part or device that is brought into contact with the fabric to be tested by means of force applied thereto. This force may be that of compressed air, gas, steam, or liquid, and so far as some of the novel features herein disclosed are concerned they are adapted to be used in connection with force applied through the instrumentality of any of the means above indicated. Mechanical skill alone will suggest the modifications necessary to adapt the plunger to a use of any of the above-mentioned sources of force to be applied thereto.

The movable jaw 4 and the plunger 8 are diametrically slotted for the passage thereinto or therethrough of a lever 9.

To reduce the friction of the lever upon the plunger to a minimum there is interposed

a pendent pointed pin or bolt 10, and to prevent undue oscillation of said bolt or pin, should it (when the fulcrum-block is dropped) become detached from the conical seat 11 in the lever 9, a screw 12 is employed, which limits the oscillations of the pin or bolt in such a manner that its pointed end shall not go beyond the limits of the conical seat 11 by reason of the head of the bolt coming in contact with the head of the screw 12. A cam 13 is arranged in the cylinder 3 and beneath the movable jaw 4, so that when oscillated by the handle 14 said jaw is forced upward into contact with the fixed jaw, so as to firmly clamp the material to be tested between the two. The fixed jaw has an outer and an inner annular rib 15 and 16, respectively, the former being thicker and higher than the latter. The movable jaw has annular grooves 17 and 18, agreeing with the ribs 15 and 16, respectively.

The object of providing the outer deeper annular groove and rib in the jaws is to take up the natural stretch of the material caused by the act of clamping the same—that is to say, the outer larger groove and rib first bring the material under strain to render the same somewhat taut, and the material is further tightened or stretched by the subsequent clamping of the same by the inner rib and groove. In testing textile fabrics this construction is particularly advantageous. The fulcrum 19 of the bar 9 rests on the upper end of the slotted block 20, through which said lever or bar passes. The lower end of said block is provided with an anti-friction roller 21, and the edges of the block are adapted to ride in ways or grooves 22, formed in the chamber 5, or, preferably, for accessibility and ease of manufacture, in a case 23, (see Figs. 6, 7, and 8,) arranged in said chamber. This case 23 is separable from the whole tester, and is preferably screwed in place, as indicated by the screw-holes, Figs. 6, 7, and 8. The whole case containing the fulcrum-block and its lifting-gear may be taken out, and the accessibility of the interior mechanism greatly heightened. A face view or elevation of the block 20 is shown in Fig. 5, the longitudinal slot 24 being that through which the lever 9 passes and the transverse seats 25 being for the fulcra of the lever, and the projection 26 over one of the seats being for the purpose of preventing an accidental displacement of the fulcra. A projection 26 may be formed upon both of the upper ends of the block, if desired.

In the case 23 and below the block 20 is a cam 27, (see Fig. 7,) which is journaled on the shaft 30 in the rear wall of the case and in the cross-bar 28 of the front portion 29 of the case 23. An elevation of this front portion is shown in Fig. 6. The back piece of the lifting-gear with the front removed is shown in Fig. 7 in elevation, and a side view of the entire case is shown in Fig. 8.

Upon the cam-shaft 30 is mounted a worm-gear 31, and meshing therewith a worm-shaft 32 is arranged transversely in the case and has its bearings in eccentric blocks 33 in the sides of the part 29 of the case.

As clearly shown in Figs. 2, 3, 6, and 7, the case 23 is slotted, as at 34, for the passage of the lever 9 therethrough. A crank 35 (see Fig. 1) is rigidly secured to the worm-shaft 32. The end of the lever 9 is connected with the case by means of a coiled spring 36, the same in this instance being connected to the lever through the medium of a link 37. Between the walls of the case is a bridge 38, secured to lugs 39, projecting from one of the walls, so as to provide a free passage between the bridge and the wall for the lever 9. A bracket 40 is mounted on the bridge, and through both the bridge and bracket the shaft 41, on which the pointer 42 is mounted, passes, and between the bracket and the bridge there is rigidly attached to said shaft a pinion 43. A geared sector 44 is pivoted at 45 on the arm 46, extending from the bridge. The sector has an arm 47, which is pivotally connected by a link 48 to the bar 9. A pin or bolt 49 passes through the lever and serves in this instance as the means for connecting the links 37 and 48 with the lever, and also serves as the means of connection with the lever of a lock mechanism employed to retain the pointer in any position over the dial which it may occupy at the time the fabric being tested is ruptured.

The locking mechanism consists of a bifurcated curved lever 50, one of its bifurcations going on each side of the lever 9 and having contact with the pin or bolt 49 passing therethrough, as shown by dotted lines in Figs. 2 and 3. The lever 50 is pivoted to the case at 51, and one arm 52 thereof projects through the case and carries a series of pawls 53 54, which may be increased to any desired number, each pawl being weighted below its pivot 55, so as to cause it to take into the curved rack 56, secured to the case, so that whatever position with relation to said rack the arm 52 may occupy one or more of said pawls is in mesh with the rack. A pawl-releasing lever 57 is pivoted to the curved lever 50 and is constructed to be brought against the weighted ends of the pawls and release the same from connection with the rack, in order to return the curved arm, the lever 9, and co-operating parts to a normal or starting position, as hereinafter described. A screw 58, Fig. 1, projects through the cylinder 3 into a groove 59, formed in the cylindrical body of the movable jaw 4, to prevent the same from rotating within the cylinder. Screws 60 serve the purpose of securing the case 23 within the chamber 5.

These several details of construction above described may be varied in any manner and to any extent within the skill of persons conversant with the construction of this class of machines without departure from our invention.

In Fig. 4 we have illustrated a modified form of plunger which is particularly adapted for use in testing textile fabrics, in that its head or the end that comes in contact with the fabrics to be tested is not substantially flat or rounded, as shown, respectively, in Figs. 2 and 3, but is formed with a rib 61, which is preferably curved on its face. It will be readily seen that in testing textile fabrics the same may be placed within the jaws 2 and 4, so that either the warp or the filling may be passed at right angles over the rib, and each, therefore, may be separately tested. A quarter-turn of the sample within the jaws determines which of the two shall occupy the desired position over the plunger to be tested.

The operation of the machine is as follows: A piece of fabric *x*, Fig. 3, is placed between the jaws. The lever 14 is oscillated over and from right to left to cause the cam 13 to force the movable jaw 4 against the fabric and firmly clamp the same. The locking mechanism is now in the position shown in Fig. 2, and the pointer stands at zero or its equivalent 150 on the dial. The crank 35 is now rotated over to the left, and this causes the worm-shaft to rotate the worm slowly, and with it the worm-gear and cam 27, in such a manner as to raise the block 20 and the lever 9, fulcrumed thereon. The fabric during this operation is stretched, as clearly shown in Fig. 3, the strength-indicating mechanism remaining at rest until the pressure applied in stretching the fabric is equal to or greater than the tension of the spring 36. Up to this point the lever 9 has swung or pivoted upon the pin or bolt 49. When the pressure upon the fabric and the tension of the spring are about equal—that is, when the fulcrum has been raised until said pressure and tension are about equal—a further upward movement of the fulcrum begins to produce an oscillation of the sector 44 by reason of its connection with the lever 9, and this oscillation of the sector rotates the pinion 43 and causes the pointer 42 to move along over the dial. During this operation the locking-lever 50 falls, or, in other words, partially rotates upon its pivot, so that its curved bifurcated arm keeps in constant contact with the pin 49, while at the same time the pawls 53 and 54 travel along the rack 56, one or more of them being in mesh while the others are passing from tooth to tooth of the rack. In order that this may be the case, said pawls are made of various lengths, differing by less than the distance between the teeth of the rack. An upward raising of the fulcrum is continued by means of the crank 35 until the fabric breaks or is ruptured. At that instant the tension of the spring retains the locking mechanism in contact with the pin 49 and the pawls are in contact with the rack, so that no backward movement of the pointer can occur. To lower the fulcrum, it is only necessary to reverse the movement of the crank 35 through a distance of about from one-fourth to one-half of a revolution, when, by reason of the friction of the worm-shaft 32 in the eccentric bearing-blocks 33, the latter are turned so as to carry the shaft from the position shown in the dotted circle, Fig. 8, to the position shown by the full circle of the same size in said figure. In other words, this movement of the eccentric blocks carries the center of the worm-shaft from *y* to *y*, (see Fig. 8,) and therefore throws it out of mesh with the worm 31, at which instant, by reason of the weight of the block 20 and the lever 9, fulcrumed thereon, the parts fall to their normal position ready for another operation. A reversal of the lever 14 removes the cam from beneath the movable jaw-body, and the jaws are thus separated and the fabric removed.

It is evident that various novel features of this invention are applicable either in whole or in part to testing-machines which do not involve annular clamping-jaws, and the invention is not, therefore, limited in this regard.

A cam seems to be a preferable means for raising the fulcrum of the lever, because by it a slow steady strong movement of the block is secured, which movement is advantageous in testing fabrics.

Having described our invention and its operation, what we claim is—

1. In a machine of the class described, the combination of a fixed annular jaw, a movable annular jaw, a plunger, a lever, and a movable fulcrum-support for said lever, and means for elevating the fulcrum-support, substantially as specified.

2. In a testing-machine, fixed and movable annular jaws, a plunger, and a lever, in combination with a movable fulcrum for the lever and pressure-indicating mechanism, substantially as specified.

3. In a testing-machine, clamping-jaws, a pressure-applying device, and a lever connected therewith, in combination with indicating mechanism and a movable fulcrum for the lever, substantially as specified.

4. In a testing-machine, a lever, a fulcrum-block for the same, and a cam-shaft, combined with a worm-screw, a worm-shaft, a cam on the cam-shaft, and means for throwing the worm-shaft into mesh with the worm, substantially as specified.

5. In a testing-machine, a movable fulcrum-block and a lever fulcrumed thereon, in combination with a cam and worm for raising the block, and a worm-shaft eccentrically journaled, substantially as specified.

6. In a testing-machine, a lever, a movable fulcrum supporting said lever, a cam, and a worm for moving the fulcrum, in combination with a shaft for rotating the worm and eccentric bearing-blocks in which the cam-shaft is journaled, substantially as specified.

7. In a testing-machine, a fulcrum-block, in combination with a fulcrum-block-elevating device and a removable case for said device, substantially as specified.

8. In a testing-machine, the combination, with fabric-retaining jaws and a cam for closing the same, of a pressure-applying device, a lever pivotally connected therewith, a movable fulcrum for the lever, and indicating mechanism connected with the lever, substantially as specified.

9. In a testing-machine, a plunger, a lever, and an interposed pin or bolt through which the pressure of said lever is transmitted, in combination with a device for limiting the oscillations of the pin or bolt, substantially as specified.

10. In a testing-machine, a slotted plunger having a pin or bolt pivoted therein, in combination with a lever bearing upon said pin, substantially as specified.

11. In a testing-machine, a plunger, a movable fulcrum-block, and a pivoted pin or bolt interposed between the plunger and the lever, in combination with a screw arranged in the plunger above the pin or bolt and means for permitting the fulcrum-block to drop, substantially as specified.

12. In a testing-machine, clamping-jaws having ribs and grooves of different depths, substantially as specified.

13. In a testing-machine, annular clamping-jaws having annular ribs and grooves of different depths and having the deeper rib and groove outside of the shallower, substantially as specified.

14. In a testing-machine, a case having a fixed jaw, a cylinder, and an opening for a dial, in combination with a chamber, a case within said chamber, and provided with a fulcrum-block and a lever fulcrumed thereon, substantially as specified.

15. In a testing-machine, a removable fulcrum-block, a cam for raising the same, and a worm-gear, in combination with a worm-shaft and a removable case in which said block, cam, and worm are arranged, substantially as specified.

16. In a testing-machine, a lever, a movable block supporting said lever, and a spring pivotally connected to the end of said lever, in combination with indicating mechanism, substantially as specified.

17. In a testing-machine, a lever and a locking-lever adapted to follow the movement of the lever, in combination with a pawl-and-ratchet mechanism connected with the locking-lever, substantially as specified.

18. In a testing-machine, a lever, a locking-lever adapted to follow the movement of the lever, and the series of pawls of varied lengths, in combination with the arm 52, bearing said pawls, and a rack with which said pawls mesh, substantially as specified.

19. In a testing-machine, a removable case, one portion being slotted for the passage of a lever, and provided with ways for a fulcrum-block and with a cam for raising the same, in combination with another part provided with a worm-shaft and worm-gear, substantially as specified.

20. In a testing-machine, a lever 9, combined with a removable fulcrum-block case formed in two parts, one of which is adapted to receive and permit of the operation of a fulcrum-block and a cam for raising the same, and the other part adapted to receive a worm gear and shaft and eccentric bearings for said shaft, substantially as specified.

21. In a testing-machine, devices by which power is applied to elevate the block, in combination with a fulcrum-block and fulcrum-block-raising mechanism constructed to be thrown out of operation by a reversal of said devices, substantially as described.

22. In a testing-machine, a lever and a locking-lever adapted to follow the movement of the lever and provided with pawls, in combination with a pawl-releasing lever and a fixed rack, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

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JAMES P. HERRON.

Witnesses:
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A. P. CLARK, Jr.