

April 14, 1925.

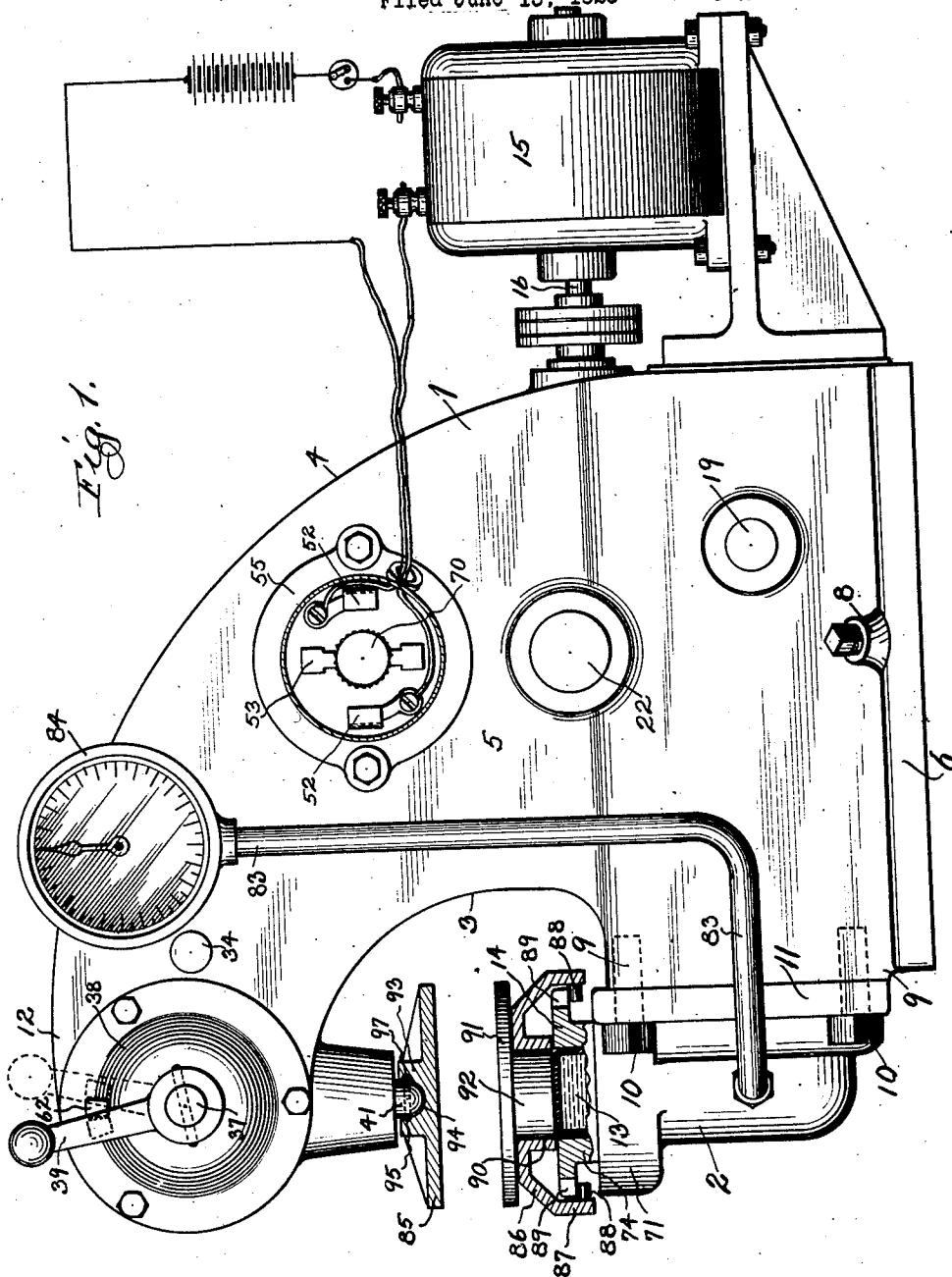
1,533,281

H. E. TAUTZ

TESTING MACHINE

Filed June 13, 1923

4 Sheets-Sheet 1



Witness:
Richard J. Jacker

Inventor:
H. E. Tautz
By J. M. Roberts
his Atty.

April 14, 1925.

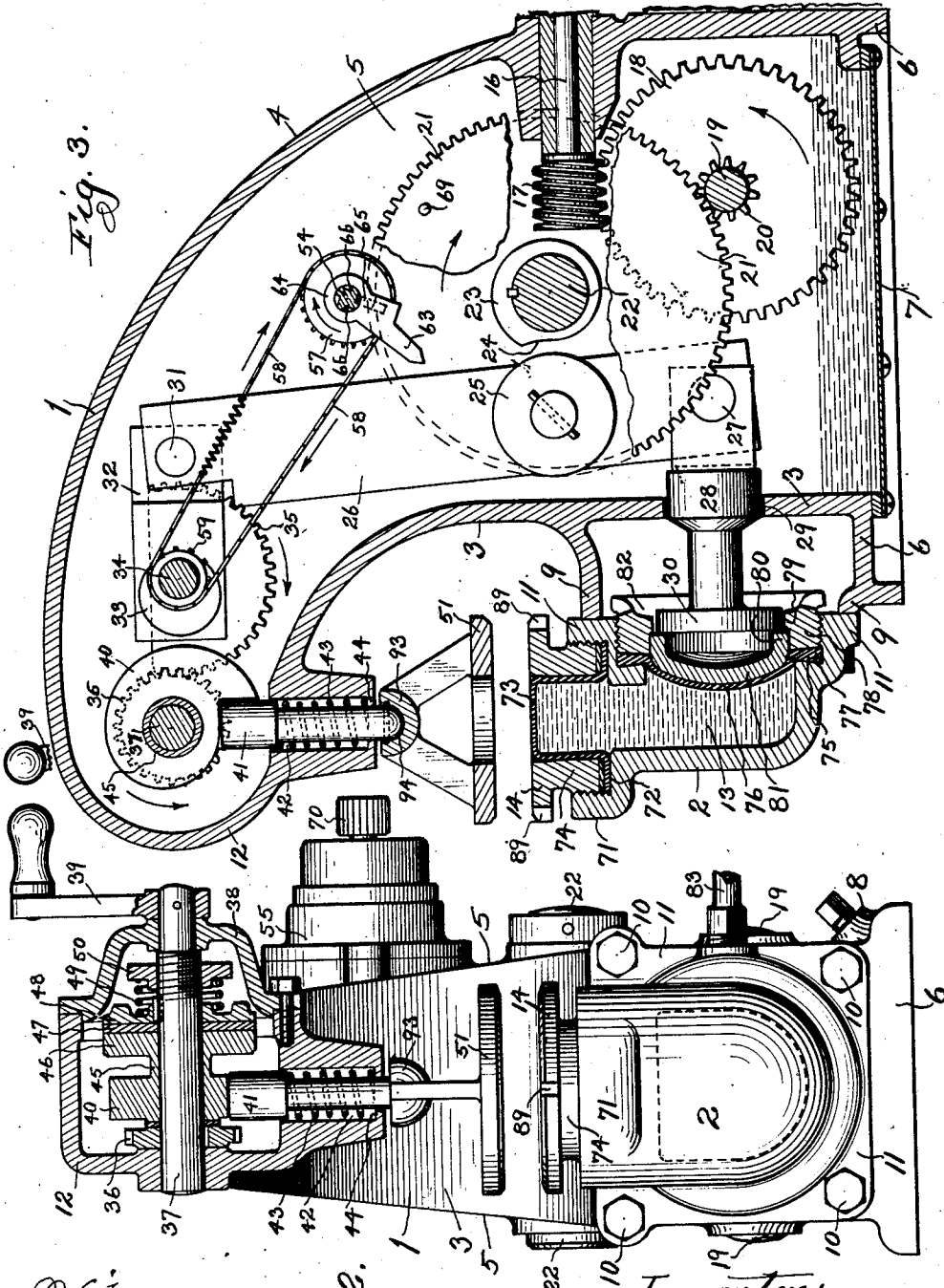
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4 Sheets-Sheet 2



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Fig. 2.

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4 Sheets-Sheet 3

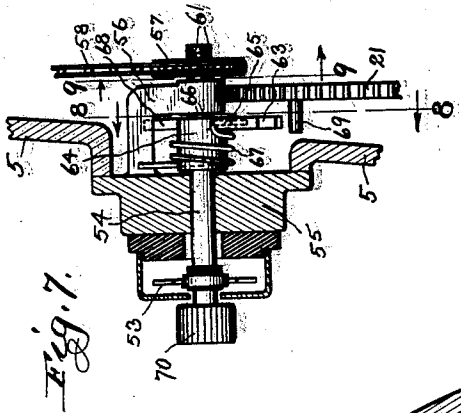


Fig. 7.

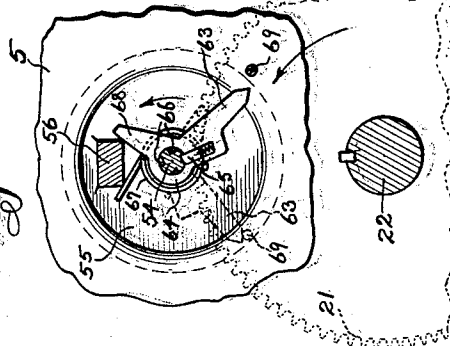


Fig. 8.

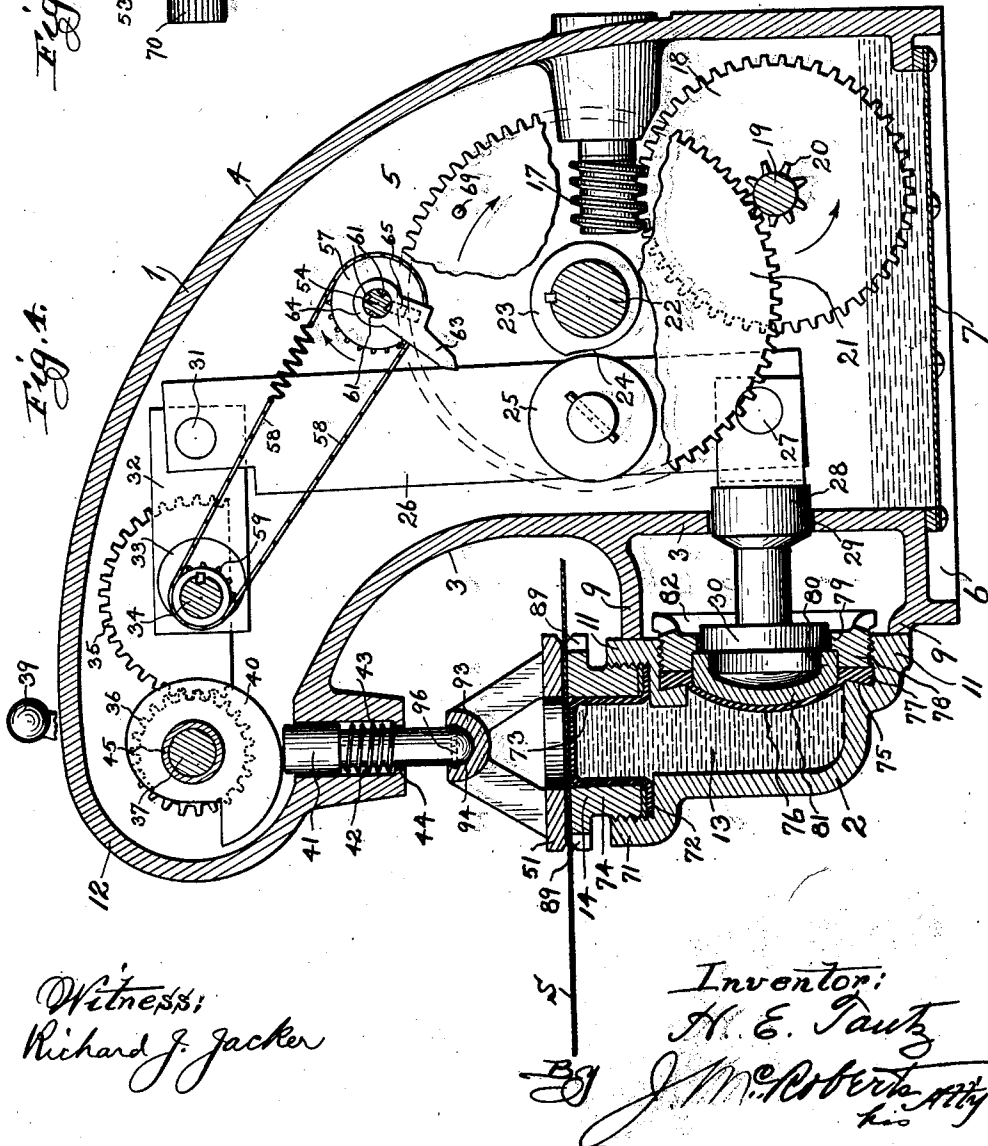


Fig. 9.

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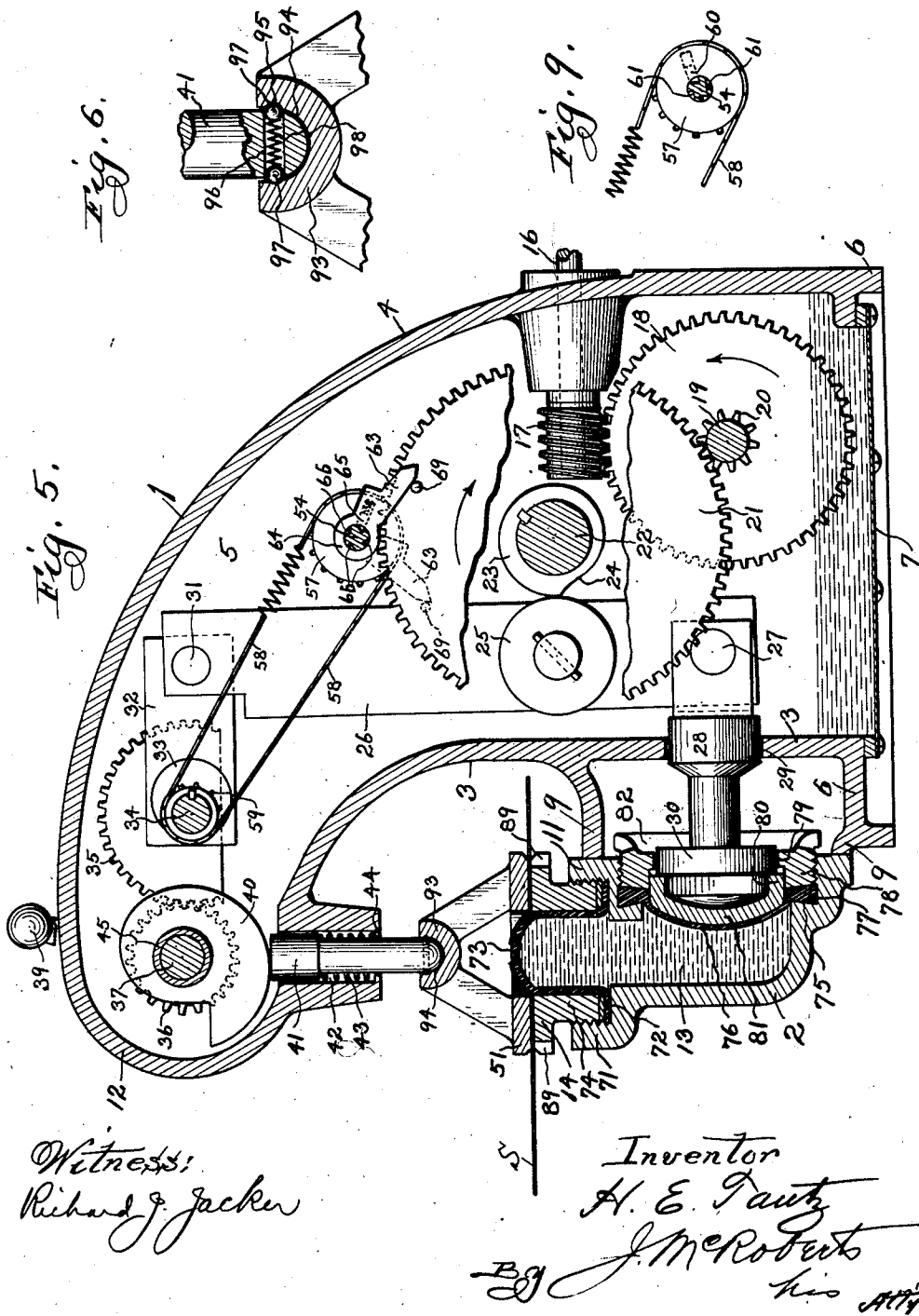
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H. E. TAUTZ

TESTING MACHINE

Filed June 13, 1923

4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE.

HERBERT E. TAUTZ, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ELISHA JESSE CADY,
OF RIVER FOREST, ILLINOIS.

TESTING MACHINE.

Application filed June 13, 1923. Serial No. 645,170.

To all whom it may concern:

Be it known that I, HERBERT E. TAUTZ, a citizen of Germany, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, having invented certain new and useful Improvements in Testing Machines, do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings.

The invention relates to certain new and useful improvements in machines for testing sheet materials, such as paper, and its primary object is to provide improved means for controlling and operating the pressure-clamp by which the material is held in place and the elastic diaphragm acting against the material. Other objects and advantages are attained as will be manifest from the disclosure.

The invention comprises certain novel organizations and arrangements of parts by which new and useful results and advantages are obtained, as will appear from the description of the construction and mode of operation of its several features, and then pointed out in the appended claims.

In the drawings Fig. 1 is a side view partly in elevation and partly in section of a machine embodying the various features of my invention, the parts being shown in their positions of rest; Fig. 2 is a front view of the same partly in elevation and partly in section; Fig. 3 is a vertical sectional view, the motor being omitted and the corresponding position of the handle being shown in dotted lines for convenience of illustration; Fig. 4 is a view similar to Fig. 3 but with the pressure-clamp in its closed position upon a sheet of material and with other parts in their positions when the machine starts its cycle of operation; Fig. 5 is a similar view with the parts in position when the machine is operating and has nearly completed its cycle; Fig. 6 is a detail view partly in section; Fig. 7 is a detail sectional view of a suitable make-and-break switch mechanism for the motor circuit; Fig. 8 is a detail view on the line 8—8 of Fig. 7, and Fig. 9 is a similar view on the line 9—9 in Fig. 7.

In the drawings the reference numeral 1 represents in general the casing of the mechanical unit of the machine, and 2 the casing of its hydraulic unit. The casing 1

is a casting composed of front, rear and two side walls indicated at 3, 4 and 5, respectively; its lower portion is substantially rectangular in cross-section and is provided with a base 6 which projects forwardly beyond its front as shown. The bottom of the casing 1 is provided with a closure plate 7 to form a lubricating oil reservoir in its lower area as indicated in the drawings and which has a suitable filler cup 8 located at the level desired for the oil so that if too much oil is poured in the excess will drain off through the cup to the proper level. The lower portion of the front wall 3 has a forwardly projecting integral flange 9 which is continued in the forwardly projecting portion of the base 6 to form a hollow housing which is substantially rectangular in outline and on which the casing 2 is removably mounted by suitable bolts passing through its base plate 11. The upper portion of the casing 1 is somewhat reduced in its cross-sectional area and is curved or arched forwardly in goose-neck contour to form a head 12 at its top above and in line with the casing 2 in which the chamber 13 for the compression fluid is located and on which the stock-platform or table 14 is carried.

An electric motor 15 having a constant speed when operating is mounted on a shelf attached to the rear of the casing 1 and its shaft 16 extends into the casing where it is provided with a worm-wheel 17 intermeshing with a worm-gear 18 keyed on a shaft 19 which is journaled in the side walls of casing 2 and carries a fixed pinion 20 which meshes with a gear 21 keyed on a shaft 22 likewise journaled in the side walls. The train of gears steps down the high speed of the motor shaft to low speed for the shaft 22, and the gear 18 dips into the oil reservoir and as it revolves at high speed effects splash-oiling of the various parts in the casing 1. The shaft 22 revolves in the direction of the arrow and carries a fixed cam 23 which has a scroll operative contour or face and a dwell or notch 24 and wipes against an anti-friction disk 25 carried on the piston-control lever 26 which is pivotally supported at its lower end at 27 on the inner end of the reciprocating piston 28 which passes through an opening 29 in the front wall 3 into the housing 9 and carries the head 30. The upper end of the lever 26 is

pivoted at 31 to the free end of a reciprocating link 32 which is carried at its other end on an eccentric 33 fixed on a shaft 34 journaled in the side walls 5 of the casing 1. The shaft 34 carries a segmental gear-wheel 35 fixed thereto in mesh with a pinion 36 keyed on the handle-shaft 37 which is journaled in one of the side walls 5 of the head 12 of the casing 1 and in a bell-shaped cover plate 38 which is removably bolted on the opposite wall 5 to close an opening therein through which access may be had to the interior parts. The shaft 37 carries a removable handle 39, and a scroll cam 40 is loosely mounted on the shaft and wipes against the upper end of a plunger 41 which reciprocates within a vertical bore 42 in a depending extension of the head 12 in the axial line of the fluid-chamber 13 in the casing 2; the lower end of the plunger is reduced in diameter and is surrounded by a coiled spring 43 which reacts between the head of the plunger and an inwardly directed flange 44 at the lower end of the bore 42 to keep the plunger in operative contact with the cam 40 which is operated by the handle-shaft 37. The cam 40 is held against movement along its shaft by the pinion 36 and has an integral hub 45 and circular disk 46, and a fiber friction disk 47 is loosely mounted on the shaft adjacent the disk 46 and is adapted to be forced into frictional engagement with it by a pressure-plate 48 splined on the shaft 37 to revolve with it and move axially along it as shown in Fig. 2. The plate 48 is provided with a concentric groove in its outer face in which the inner end of a coiled spring 49 seats, and the outer end of this spring fits over an inner circular boss on the pressure nut 50 which screws on a thread on the shaft 37; by setting the nut in proper position on the shaft the parts 46, 47 and 48 are brought into frictional engagement so that when the shaft 37 is turned the cam 40 is operated to lower the plunger 41 which carries the apertured stock-clamp 51. The cam 40 has a flat or inoperative portion into which the plunger 41 is retracted by its spring when the handle is in its normal position as shown in Fig. 3, and is operative from this point so that the plunger is projected sufficiently to seat the clamp 51 on the stock on the table 14 when the cam is turned to its operative position as shown in Figs. 4 and 5. By adjusting the nut 50 the stress or force of the spring 49 can be varied so that the clamp 51 will bear on the stock with different degrees of pressure when the cam is turned to its operative position; this adjustment of the pressure nut is calibrated to afford predetermined pressure on the stock in accordance with the known crushing strength or resistance of different grades of material so that the clamp can be set down upon any

grade to approximately its usual crushing resistance without breaking it or affecting its characteristics, and so without affecting its normal resistance to the action of the liquid in the chamber 13. This eliminates the human or personal factor or element with its usual variations and uncertainties in setting the clamp for the correct pressure, and ensures predetermined pressure of the clamp in accordance with known variations in stock. The slip-connection between the stock-clamp and its operating-shaft afforded by the friction disk 47 and the co-operating parts is advantageous as it provides a safety device that prevents the pressure of the clamp on the stock being greater than the force which the spring 49 provides; the travel imparted to the clamp by the shaft sets up sufficient clamping pressure to hold soft stocks without affecting their normal resistance to the action of the liquid in the chamber 13, and when denser or more solid stock is tested the shaft moves the clamp as usual but the relatively greater resistance of such stock prevents the clamp from going to its full distance or travel, and this difference is taken up or compensated for by the slip-connection. The construction allows a predetermined clamp pressure to be set up by the spring 49 and stopped after the clamp has seated on the stock, so that clamping of soft or easily crushable fabrics and hard fabrics or stock can be accomplished by merely adjusting the nut 50 and without any change in the clamping parts.

The friction-coupling between the shaft 37 and cam 40 also permits the shaft to be further rotated in the same direction to start the motor 15 after the clamp is set. The motor circuit is controlled by any suitable make-and-break switch, and for purposes of illustration a four-point switch is shown with its terminals 52 in the motor-circuit adapted to be opened and closed by a movable contact 53 (Fig. 1) mounted on a rotatable shaft 54 which is journaled in a plate 55 fastened over an opening in one of the side walls 5 and in a depending arm of a bracket 56 carried by the plate (Figs. 7 and 8). The shaft 54 carries a loose sprocket-wheel 57 which is operated by a sprocket-chain 58 from a driving-sprocket 59 on the shaft 34, and the wheel 57 carries a spring-pawl 60 which engages any one of the four notches 61 in the shaft 54 to turn the latter when the wheel is turned by its chain (Fig. 9). The handle 39 normally stands in the position shown in full lines in Fig. 1 against a stop 62, and when it is turned to operate the shaft 37 to set the clamp 51 the gears 35 and 36 turn the shaft 34 in the direction of its arrow which causes the eccentric 33 to turn from its retracting position in Fig. 3 toward its protracting position in Figs. 4 and 5; the ratio of the gears

35 and 36 is such that the movement of the handle to position to set the clamp causes the eccentric 33 to make less than a half-turn, so that the initial movement of the eccentric does not move the lever 26 to its operative position, and when the clamp is thus brought to its operative position further movement of the handle in the same direction overcomes the frictional resistance of the slip-connection at the disk 47 and completes the half-turn of the eccentric to project the link 32 and move the lever 26 to its operative position to throw the roller 25 into the path of the cam 23; the full stroke of the handle 39 is limited by the stop 62. The half-turn of the eccentric-shaft 34 gives the sprocket-wheel 57 and shaft 54 a quarter turn to move the switch contact 53 from its "off" position in Fig. 1 to position to close the motor circuit through the terminals 52, and the motor turns the shaft 22 to cause the cam 23 to rock the lever 26 on its now fixed pivot 31 to project the piston 28 to place the fluid in the chamber 13 under compression. When the cam 23 completes its stroke the switch-shaft 54 is automatically rotated to open the motor circuit by any suitable trip-mechanism. In the form shown for this latter purpose a trip lever 63 has an integral hub 64 loosely mounted on the shaft 54 between the plate 55 and the downwardly projecting arm of the bracket 56, and carries a spring-pressed pawl 65 adapted to engage any one of the four notches 66 in the shaft to turn the latter when the lever is moved in one direction and to travel idly over the shaft when the lever is reversed and when the shaft is turned by the sprocket-wheel 37. The lever 63 is held in its normal position shown in full lines in Fig. 8 by a coiled-spring 67 reacting between its hub 64 and the bracket 56, its movement under stress of the spring being limited by a stop-arm 68 abutting against the bracket. When the shaft 54 is turned by the pawl 60 to close the switch to operate the motor, the pawl 65 rides over it and snaps into the next notch 66. The gear 21 carries a pin 69 in the path of the lever 63 which moves from its position in Fig. 3 when the motor starts and at the end of the cycle of the machine wipes against the lever and throws it to the position shown in full lines in Fig. 5 and in dotted lines in Fig. 8 to give the shaft 54 a quarter turn to open the switch to stop the motor, the pawl 60 now riding over the shaft and snapping into the next notch 61. When the pin 69 passes beyond the lever 63 the spring 67 returns the lever to its normal position, its pawl riding over the shaft 54 and snapping into the next notch 66; the parts are timed so that the dwell 24 in the cam 23 reaches the disk 25 on the piston-actuating lever 26 at the moment that the switch is thrown off by the trip-lever. The

switch-shaft 54 is provided with a knob 70 by which it may be turned in an emergency, so that even after the switch is thrown to start the machine the operation can be stopped by turning the emergency knob.

The casing 2 is centrally bored to form a vertical chamber 13 for the compression fluid; its upper open end is enlarged into a head 71 and interiorly shouldered to form a circular seat 72 for the expansion diaphragm 73 of elastic material, and the stock-supporting platform 14 is provided with a central hollow stem 74 in extension of the compression chamber and in threaded engagement with the interior of the head 71 to clamp the peripheral lip of the diaphragm on its seat to make a liquid-tight joint. The diaphragm 73 is cup-shaped in cross-sectional outline; only its lower annular rim or lip is clamped, and its elongated body substantially fills the bore of the stem 74 so that its area of distention includes its relatively long side walls as well as its top wall and works freely in the stem without resistance on any of its expanding portions. The lower end of the casing 2 is provided with a lateral passage which aligns with the hollow housing of the compression chamber and is interiorly shouldered to form an undercut seat 75 for the periphery of a compression diaphragm 76 of elastic material. The diaphragm 76 preferably is saucer-shaped in cross-sectional outline; its body is concavo-convex and its periphery or rim 77 is thickened and beveled outwardly toward its edge to wedge against the seat 75 upon which it is clamped to make a fluid tight joint by an annular collar 78 which is threaded into the passage. This collar is provided with an interior annular flange 79 to form a seat for the annular skirt or rim 80 of a metallic pusher-head 81 which is shaped to correspond with and fit against the expansible body of the diaphragm. The flange 79 also forms a bearing for the piston-head 30, and the collar 78 is provided with a flared outer mouth 82 which co-operates with the piston-head as herein-after described. The compression chamber 13 also has an opening for a pipe 83 which leads to an indicating and registering gage 84 subject to and operated by the pressure of the fluid in the chamber and indicating the pressure by its pointer on its dial in pounds and fractions thereof in the usual manner. The fluid in the chamber 13 substantially fills it and reacts against both diaphragms, so that the pusher-head 81 is normally held on its seat and against the piston-head 30. The fluid chamber is sealed by the diaphragms so that by removing the bolts 10 the entire hydraulic unit can be removed from the machine for calibrating and repairing its parts; the head 81 then retains the diaphragm 76 in its normal posi-

tion so that all parts of the unit are in their usual relation. When this unit is disassembled from the casing 1 the piston is held in its usual alinement by its pivot 27 and guide passage 29, and in mounting the unit in place the piston can be drawn forward so that its head forms a projection to enter the flared mouth 82 to center the casing 2 in position on the casing 1. When the parts are assembled the piston is normally held in retracted position by the resistance of the liquid to the diaphragm 76.

When the machine is at rest the parts are in the positions shown in Figs. 1 and 3. When a piece of stock S to be tested is placed on the stock-platform 14 the operator turns the starting lever 39 in the direction indicated in Fig. 1; the initial movement of the starting-lever depresses the plunger 41 to close the clamp 51 upon the stock, the continued rotation of the handle by the operator overcoming the friction of the slip-connection at the disk 47 operates the shaft 34 to turn the eccentric 33 to move the lever 26 on its now stationary lower pivot 27 to throw the friction wheel 25 into the path of the cam 23, and also closes the switch to operate the motor. The rotation of the cam 23 then causes the lever 26 to rock on its now stationary upper pivot 31, and the piston 30 and head 81 operate on the diaphragm 76 to set up pressure in the fluid in the chamber 13 and distend the diaphragm 73 sufficiently to rupture the stock, as indicated in Fig. 5. When the test is completed the operator may at once reverse the handle to its initial position; this movement does not affect the switch as the pawl 60 idles over the shaft 54 into the next notch, but it reverses the cam 40 to take the pressure off the clamp 51 which is immediately raised by its spring 43, so that the stock may be at once removed without waiting for the machine to complete its cycle and it also reverses the eccentric 33 to retract the link 32 so that the lever 26 rocks on its lower pivot 27 to withdraw the roller 25 from the cam 23 to release the piston 28 from the action of the cam and allow the resilient force or stress of the diaphragms to retract the piston to take the pressure off the liquid in the chamber and prevent unnecessary distention of the diaphragms. The provision of the eccentric connection between the piston-operating lever 26 and the shaft 37 is thus advantageous as it provides a safety release device whereby the pressure of the cam 23 on the piston 28 can be released before the machine completes its cycle to relieve the pressure on the diaphragm 76 and in the compression-chamber and the resulting pressure of the liquid on the diaphragm 70 to allow the diaphragms to immediately cease their distention and resume their normal

positions so that during the completion of the stroke of the cam 23 in the cycle of the machine neither diaphragm will be further or unnecessarily distended. When the handle 39 is thus reversed the machine completes its cycle but that part of the travel of the cam 23 made after the handle is reversed produces no pressure on either diaphragm; by this arrangement the diaphragms are protected against unnecessary distention and their life is prolonged. When the gear 21 completes its revolution the pin 69 operates the switch-lever 63 to break the motor circuit to stop the motor; when this occurs the pin 69 clears the lever 63 which is returned by its spring 67 to its normal position with its pawl in the succeeding notch 66 of the switch-shaft, and the dwell 24 in the cam 23 is opposite the friction-disk 25, so that the switch mechanism and the pressure parts are all in their initial positions. If the operator does not reverse the handle 39 immediately upon the completion of the test the machine completes its cycle and stops, and the handle may then be returned to its normal position to allow the clamp to rise. In either case, all the parts are restored to position for another test. In using the machine the operator merely rocks the starting-lever 39, the pressure of the clamp is sufficient to prevent displacement of the stock between it and the table by the subsequent distention of the diaphragm 73, and the flow of the current through the constant-speed motor causes the machine to exert uninterrupted and uniformly increasing pressure on this diaphragm so that the rupture of the stock occurs normally and naturally when the true limit of its strength is reached, the gage registering the exact amount of pressure existing at the moment the rupture occurs, and after the rupture all the parts are restored to position for another test.

The machine as above described is used for making rupture or pop tests, for which purpose the clamp 51 is provided with a central aperture to register with the bore of the stem 74 and with the usual upper converging spider arms to allow space for the upward distention of the diaphragm 73, as shown in Figs. 3, 4 and 5. When it is desired to make crushing tests, as for example in testing the resistance or crushing strength of corrugated paper boards, the clamp is not apertured and the platform 14 forms the support for a supplemental table which is provided with a movable anvil to co-operate with the clamp to crush the stock. As shown in Fig. 1, the clamp 85 is a solid or unapertured plate and has no upper spider, and the supplemental table 86 is in the form of a cap provided with an annular depending flange 87 which surrounds the periphery of the platform 14 and is provided with

inwardly directed lugs 88 adapted to pass down through open-end slots 89 in the edge of the platform, so that by giving the table a slight turn the lugs will take under the edge of the platform and lock the table in place. The table is provided with a central opening or passage 90 of substantially the same diameter as and in register with the bore of the platform 14, and a movable anvil 91 above the table is provided with a depending central stem 92 which fits loosely in the opening 90 and extends down approximately flush with the upper portion of the diaphragm 73 so that this diaphragm exerts its pressure on the anvil from the beginning of the stroke of the piston and is not compelled to rise through the cap before beginning its pressure. When a crushing test is made the stock is placed on the anvil and the machine is operated as above described.

In order to provide for simple and rapid interchange of clamps the upper end of each clamp is provided with a hollow head 93 having a cup-like aperture or seat 94 provided with a circular horizontal groove 95 in its inner face, and the lower end of the plunger is provided with a transverse bore 96 to receive an opposite pair of friction balls 97 and an intermediate expanding spring 98; the ends of the passage are slightly contracted to form seats for the balls and prevent their dislodgement but allow their outer surfaces to project out of the passage to enter the groove 95. The spring and balls may be assembled in the bore in any suitable manner, and when the clamp is assembled on the plunger, as shown in Fig. 6, the tension of the spring 98 holds the balls in the groove 95 with sufficient force to interlock the clamp and plunger against accidental longitudinal separation, but yields to the pressure of the head on the balls to assemble and disassemble the parts. The flat portion of the cam 40 into which the plunger 41 is retracted by its spring 43 is deep enough to permit either clamp to normally stand far enough away from its associated table to allow the clamp to clear the latter in assembling and disassembling the clamp and plunger. In both cases the normal position of the upper end of the diaphragm 73 is approximately at operative level, and the only pressure established in the chamber 13 and registered on the gage is that actually required to test the fabric.

The area of the portion of the diaphragm 76 operating on the liquid in the chamber 13 is much greater than the area of the head of the diaphragm 73 operating on the stock in Fig. 3 or on the anvil in Fig. 1, so that a slight movement of the former diaphragm produces an increased movement of the latter diaphragm and powerful pressure on the stock; in practice the ratio of

such areas is about 4 to 1. As the necessary movement or distention of the diaphragm 76 is slight, its life is prolonged; and as the distention area of the diaphragm 73 includes its elongated body and its head the stretching of its material is distributed over a much larger surface than where a flat diaphragm is used, and the life of this diaphragm is prolonged, while the two diaphragms always seal the chamber and ensure a self-contained hydraulic unit.

I claim:

1. In a machine for testing fabrics, a casing having a movable stock-clamp and a reciprocable piston, a second casing having a liquid chamber provided with a platform and a diaphragm in the line of movement of the clamp and a diaphragm in the line of reciprocation of the piston, the diaphragms sealing the chamber, and means to detachably mount the second casing on the other casing.

2. In a machine for testing fabrics, a casing having a stock-clamp movably mounted therein and a reciprocable piston, the lines of movement of said piston and clamp being disposed in angular relation, a second casing having a liquid chamber and provided with a platform in alinement with the line of movement of the clamp, an expansion diaphragm closing the platform end of said chamber, a compression diaphragm closing the other end of said chamber in line of movement of the piston, and means to detachably mount the second casing on the other casing.

3. In a machine for testing fabrics, a casing having a head at its top and a housing at its bottom, a stock-clamp movably mounted on the head, a piston in the housing, means in the casing to operate the piston, a second casing having a liquid chamber and provided with a platform in the line of movement of the clamp, an expansion diaphragm closing the platform end of said chamber, a compression diaphragm closing the other end of said chamber, and means to detachably mount the second casing on said housing.

4. In a machine for testing fabrics, a casing having a head at its top and a housing at its bottom, a stock-clamp movably mounted on the head, a piston in the housing, means in the casing to operate the piston, a second casing having a liquid chamber and provided with a platform in the line of movement of the clamp, an expansion diaphragm closing the platform end of said chamber, a compression diaphragm closing the other end of said chamber, a pusher-head mounted on said second casing between the compression diaphragm and piston, and means to detachably mount said second casing on said housing.

5. In a machine for testing fabrics, a cas-

ing having a movable stock-clamp and piston whose lines of movement are disposed in angular relation, a second casing having a liquid chamber provided with openings respectively in the lines of movement of the clamp and piston, an expansion diaphragm closing the first of said openings, a platform at the diaphragm, a compression diaphragm closing the other chamber-opening, a collar in said last opening having an interior flange, a pusher-head in said collar seating on said flange between the piston and compression diaphragm, and means to detachably mount the second casing on the other casing.

6. In a machine for testing fabrics, a casing having a movable stock-clamp and piston whose lines of movement are disposed in angular relation, a second casing having a liquid chamber provided with relatively large and small openings respectively in the lines of movement of the piston and clamp, an expansion diaphragm closing the smaller opening, means to clamp said diaphragm on the chamber, a compression diaphragm closing the larger opening, a collar in said last opening clamping said last diaphragm to the chamber, a flange on the inner periphery of said collar, a cup-shaped pusher-head slidably fitting in said collar and seating on said flange between the piston and compression diaphragm, and means to detachably mount the second casing on the other casing.

7. In a machine for testing fabrics, a hydraulic unit comprising a casing forming a compression chamber having one end closed by an expansion diaphragm and its other end closed by a compression diaphragm, a pusher-head in alinement with the operative portion of said last diaphragm, and a collar retaining said head in position against said last diaphragm.

8. In a machine for testing fabrics, a casing forming a compression chamber having a shouldered opening, a diaphragm closing said opening consisting of an elongated tubular body having a head at one end and an annular rim at its other end, and a platform having a hollow stem surrounding the body of the diaphragm and clamping its rim on the shoulder of the chamber.

9. In a machine for testing fabrics, a casing forming a compression chamber having an opening surrounded by an undercut shoulder, a diaphragm consisting of a body fitting into said opening and a beveled rim fitting against said shoulder, and a collar clamping said rim on said shoulder.

10. In a machine for testing fabrics, a casing forming a compression chamber having an opening and a diaphragm closing its opening, a fabric support and clamp in alinement, a plunger to operate the clamp, a shaft carrying a cam to operate the plun-

ger, and an adjustable friction-coupling between the cam and shaft to operate the clamp by the rotation of the shaft.

11. In a machine for testing fabrics, a casing forming a compression chamber having an opening and a diaphragm closing its opening, a fabric support and clamp in alinement, a handle-shaft, a cam loose on the shaft and controlling the clamp, a friction disk loose on the shaft, a pressure plate splined on the shaft, a nut threaded on the shaft adjacent the pressure plate, and an expansion spring between the nut and plate to couple the plate, disk and cam in frictional engagement.

12. In a machine for testing fabrics, a casing forming a compression chamber containing liquid and having an opening and a diaphragm closing its opening, a piston for imparting pressure on the diaphragm, a piston-operating cam, a lever pivoted at one end on the piston, a handle-shaft, and mechanical connections between the handle-shaft and lever to move the latter into and out of the path of the cam by the rotation of the handle-shaft.

13. In a machine for testing fabrics, a casing forming a compression chamber containing liquid and having an opening and a diaphragm closing its opening, a piston for imparting pressure on the liquid, a piston-operating cam, a lever pivoted at one end on the piston, a handle-shaft, and mechanical connections including an eccentric between the handle-shaft and lever to move the latter into and out of the path of the cam by the rotation of the handle-shaft.

14. In a machine for testing fabrics, a casing forming a compression chamber containing liquid and having an opening and a diaphragm closing its opening, a piston for imparting pressure on the liquid, a rotatable cam-shaft, a lever pivoted at one end on the piston and operated by the cam, a link pivoted on the other end of the lever, a shaft carrying an eccentric to move the link to swing the lever into and out of the path of the cam, a handle-shaft, and connections between the shafts to turn the eccentric by rotating the handle.

15. In a machine for testing fabrics, a casing forming a compression chamber containing liquid and having an opening and a diaphragm closing its opening, a fabric support at the opening and a clamp in alinement with the support, a cam to set the clamp, a shaft carrying the cam and having a handle, a friction-coupling between the shaft and cam, a piston for imparting pressure on the liquid, a piston-operating cam, and means controlled by the handle-shaft to cause the cam to operate the piston after the clamp is set.

16. In a machine for testing fabrics, a casing forming a compression chamber con-

taining liquid and having an opening and
 a diaphragm closing its opening, a fabric
 support and clamp in alinement, a cam to
 set the clamp, a shaft carrying the cam and
 5 having a handle, a friction-coupling between
 the shaft and cam, a piston to compress the
 liquid, a second cam, a lever on the piston
 in the line of the second-named cam, and
 connections between the lever and handle-
 10 shaft to move the lever into the path of the
 cam to operate the piston by the further ro-
 tation of the shaft after the clamp is set.

17. In a machine for testing fabrics, a
 casing forming a compression chamber con-
 15 taining liquid and having an opening and a
 diaphragm closing its opening, a fabric sup-
 port and clamp in alinement, a starting
 shaft, a piston for imparting pressure on
 the liquid, piston-shaft, means operated by
 20 the piston-shaft to actuate the piston, a mo-
 tor to operate the piston-shaft, a switch for
 controlling the motor, a friction coupling
 between the starting shaft and clamp to set
 25 the latter by the initial rotation of said
 shaft, and connections between the starting
 shaft and switch to start the motor by the
 further rotation of said shaft.

18. In a machine for testing fabrics, a
 casing forming a compression chamber con-
 30 taining liquid and having an opening and a
 diaphragm closing its opening, a fabric sup-
 port and clamp in alinement, a starting
 shaft, a piston for imparting pressure on
 the liquid, piston-shaft, means operated by
 35 the piston-shaft to actuate the piston, a mo-
 tor to operate the piston-shaft, a switch for
 the motor, friction connections between the
 starting shaft and clamp to set the latter by
 the initial rotation of said shaft, connections
 40 between the starting shaft and switch to
 start the motor by the further rotation of
 said shaft, and means operated by the pis-
 ton-shaft to open the switch when the shaft
 completes its rotation.

19. In a machine for testing fabrics, a
 casing forming a compression chamber
 containing liquid and having an opening
 and a diaphragm closing its opening, a fab-
 ric support and clamp in alinement, a start-
 50 ing shaft, a piston for imparting pressure
 on the liquid, piston-shaft, means operated
 by the piston-shaft to actuate the piston, a
 motor to operate the piston-shaft, a shaft
 carrying a switch for the motor, friction
 55 connections between the starting shaft and
 clamp to set the latter by the initial rota-
 tion of said shaft, connections between the
 starting shaft and switch shaft to move the
 latter to start the motor by the further rota-
 60 tion of the starting shaft, and a trip-device
 on the switch shaft operated by the piston
 shaft at the end of its rotation to open the
 switch.

20. In a machine for testing fabrics, a
 65 casing forming a compression chamber

containing liquid and having a diaphragm,
 a piston to impart pressure on the liquid,
 shaft, means operated by the shaft to ac-
 tuate the piston, an electric motor to drive
 the shaft, a switch for the motor circuit, 70
 a spring-retracted trip-lever to open the
 switch, and a pin actuated by the shaft to
 move said lever when the shaft completes
 its rotation to open the switch.

21. In a machine for testing fabrics, a 75
 casing forming a compression chamber
 containing liquid and having an opening
 and a diaphragm closing its opening, a fab-
 ric support at the diaphragm and a movable
 fabric clamp in alinement, a starting shaft, 80
 a piston for imparting pressure on the
 liquid, a cam to operate the piston, a piston-
 controller movable into and out of posi-
 tion between the cam and piston, a motor
 to rotate the cam, switch mechanism for the 85
 motor, connections between the starting
 shaft and clamp to set the latter by the
 initial movement of the starting shaft, and
 connections between the starting shaft and
 switch and piston controller to operate the 90
 controller and switch by the further rota-
 tion of the shaft.

22. In a machine for testing fabrics, a
 casing forming a compression chamber
 containing liquid and having an opening 95
 and a diaphragm closing its opening, a fab-
 ric support and clamp in alinement, a pis-
 ton for imparting pressure on the liquid,
 shaft, means operated by the shaft to ac-
 100 tuate the piston, a motor to drive the shaft,
 and manually operated means to release the
 clamp and piston while the shaft rotates.

23. In a machine for testing fabrics, a
 casing forming a compression chamber
 containing liquid and having an opening 105
 and a diaphragm closing its opening, a fab-
 ric support and clamp in alinement, a piston
 in the chamber for imparting pressure on
 the liquid, shaft, means operated by the
 shaft to actuate the piston, a motor to 110
 drive the shaft, a handle, and means con-
 trolled by the handle to set the clamp
 and cause the motor to function when the
 handle is moved in one direction and to
 release the clamp and piston before the com- 115
 pletion of the shafts rotation when the han-
 dle is moved in the opposite direction.

24. In a machine for testing fabrics, a
 casing forming a compression chamber
 containing liquid and having an opening 120
 and a diaphragm closing its opening, a fab-
 ric support and clamp in alinement, a piston,
 shaft, means operated by the shaft to ac-
 tuate the piston, a motor to rotate the shaft,
 switch mechanism for the motor, a handle 125
 to control the clamp, connections between
 the handle and switch including a pawl and
 ratchet to close the switch after the handle
 is turned to set the clamp to its operative
 position, and connections between the piston

and handle to release the piston when the handle is turned to release the clamp.

25. In a machine for testing fabrics, a casing forming a compression chamber containing a liquid and having an opening and a diaphragm closing its opening, an apertured fabric-support at the opening, a fabric clamp, a handle to set the clamp on the stock on the support, a piston for imparting pressure on the liquid in the chamber, a rotating cam-shaft, a piston-controller between the cam and piston, and means operated by the handle to move the controller into the path of the cam to operate the piston and out of said path to release the pressure of the piston before the shaft completes its revolution.

26. In a machine for testing fabrics, a

casing forming a compression chamber containing a liquid and having an opening and a diaphragm closing its opening, a fabric-support at the opening, a fabric clamp, a handle, an adjustable connection between the handle and clamp, a piston for imparting pressure on the liquid in the chamber, a cam shaft, a piston-controller between the cam and piston, and means operated by the handle to move the controller into the path of the cam to operate the piston and out of said path to release the pressure of the piston before the shaft completes its revolution.

In testimony whereof I affix my signature.

HERBERT E. TAUTZ.