(No Model.)

M. H. TOMKINS.

YARN TESTING MACHINE.

No. 570,970. Patented Nov. 10, 1896.

Fig. 1.

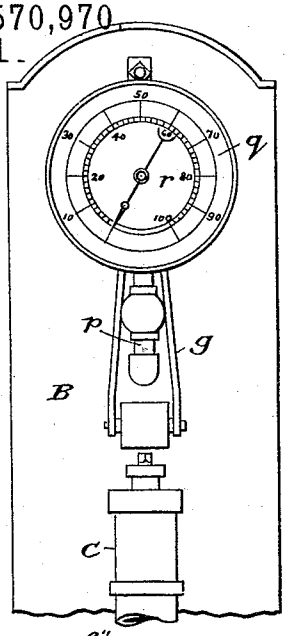

Fig. 2.

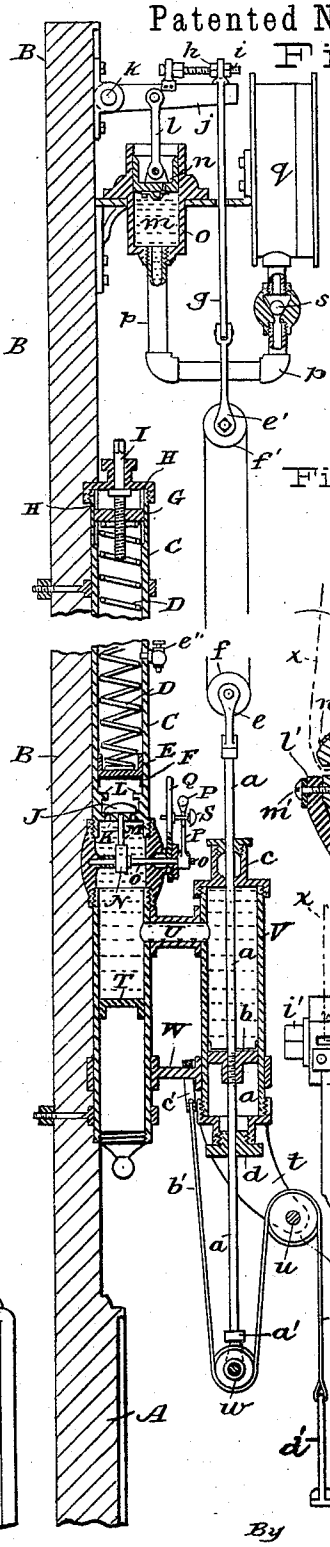

Fig. 3.

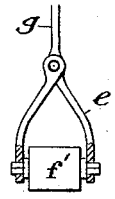

Fig. 4.

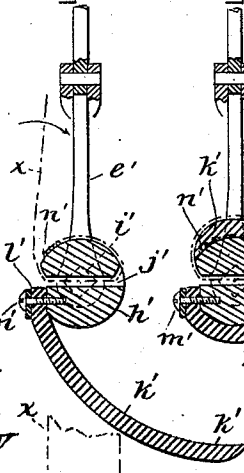

Fig. 5.

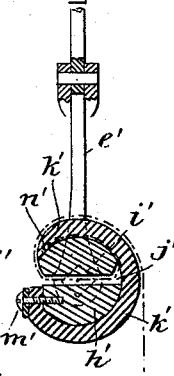

Fig. 6.

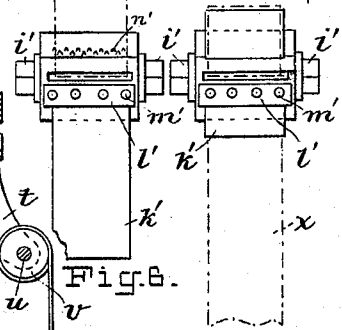

Fig. 7.

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MARK H. TOMKINS, OF NEW YORK, N. Y.

YARN-TESTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 570,970, dated November 10, 1896.

Application filed February 15, 1896. Serial No. 579,423. (No model.)

To all whom it may concern:

Be it known that I, MARK H. TOMKINS, a subject of the Queen of Great Britain, and a resident of New York, in the county of New York and State of New York, have invented a certain new and useful Improved Yarn, &c., Testing Machine, of which the following is a specification.

Before describing my invention I will briefly refer to the apparatus now in use, pointing out some of its defects in order that the advantages flowing from my invention may be more readily understood.

Yarn-testing apparatus as heretofore used have been of two general classes, one operated by steam, water, or other power, which is uniform in its action, and the other much less expensive apparatus actuated by hand and usually by the turning of a crank.

The power apparatus is necessarily expensive, and as a matter of fact there is not probably one such machine used to fifty of the smaller hand variety. The power apparatus is accurate and effective for the purpose, and my invention, so far as accuracy in operation is concerned, is no improvement over it; but all apparatus known to me which have been heretofore used, operated by hand, are exceedingly inaccurate, and instead of being a reliable guide to the manufacturers are exceedingly misleading and, in my judgment, tend rather to create than to remove inaccuracies in the manufacture. The reason is this: It has been demonstrated over and over again and is a recognized fact in this art that uniformity in the application of the strain is essential to accuracy in the test, and that either accelerated or retarded application thereof results in a misleading registration, and it has been the experience of all persons who use the hand-machines that the human organism is too imperfect as a power by which to drive it to secure accurate results. There may be found occasionally an individual who can manipulate the apparatus with measurable uniformity and secure measurably accurate relative tests, but such persons are rare, and in the vast majority of cases as the operator sees the indices approaching the point where he expects fracture his manual acts are either accelerated or retarded and an incorrect registration is inevitably the result.

Why it is that even a slight increase or decrease in the speed of applying the strain effects this result I will not here undertake to explain. The fact, however, stands universally recognized.

To return now to my invention. It relates to an inexpensive, compact, automatically-acting apparatus adapted to do its work entirely disconnected from any source of power other than that contained within itself, and it may be located in the factory, in the office, in a store, or in the owner's private dwelling.

Referring to the drawings hereof, Figure 1 illustrates an elevation of the apparatus, a section being broken away. Fig. 2 illustrates a central vertical section of the apparatus as shown in Fig. 1. Fig. 3 illustrates a detail of the upper suspender adapted to test yarn. Fig. 4 illustrates an endwise elevation, partly in section, of a suspender adapted to test cloth, the cloth being shown in dotted lines in process of application thereto. Fig. 5 illustrates a view the same as Fig. 4, the cloth being in position. Fig. 6 illustrates a rear elevation of that which is shown in Fig. 4. Fig. 7 illustrates a rear elevation of that which is shown in Fig. 5.

A illustrates the lower portion or base of the apparatus, which may be attached to a horizontal base or support or may be simply finished with a molding at the bottom, the apparatus as a whole to be fastened to the wall or other suitable support.

B is a frame or vertical base to which the apparatus is attached.

C is a cylinder, preferably of brass.

D is a stiff spring inclosed with the upper part of the cylinder, and which is preferably of such diameter as to substantially fill the cylinder.

E is a piston provided with a packing of suitable construction F, which is attached to the lower end of the spring.

G is a follower adapted to slide vertically in the upper end of the cylinder. I prefer to form grooves in its edge, in which fit splines H H or other equivalent to prevent the follower G from turning.

I is a threaded bolt having a squared end, which engages with a correspondingly-threaded hole in the follower G, whereby the follower may be moved upwardly or downwardly,

as desired, thus increasing the diminishing strains of the spring D.

J is a check-valve seated upon a diaphragm K, which has perforations through it, as shown.

L are stops or a stop to limit the upward movement of the check-valve.

M is the valve-stem, projecting downwardly into a chamber beneath the diaphragm K. The end of the stem rests upon a cam N, which is set upon a shaft O, which is journaled in supports, as shown. On the outer end of the shaft O is fastened a lever P.

Q is a plate provided with a series of holes R, in which a pin S is adapted to be inserted. In order that the pin may be supported firmly by the holes in the plate, I prefer that it should thread into them, preferably with coarse threads of a quick pitch, a shoulder being provided upon the pin above the thread.

T is a diaphragm, which I prefer to locate in the cylinder C some distance above its lower end, since the lower portion is used as a means for supporting certain of the other parts of the apparatus, as shown and described.

U is a short section of tube which connects the cylinder C with an adjoining cylinder V.

W is a stay whereby the cylinder V is additionally supported upon the cylinder C.

a is a rod. The portion of it which is within the cylinder V serves as a piston-rod to which the piston *b*, which is provided with a suitable packing, as shown, is attached.

c is an ordinary stuffing-box.

d is an ordinary screw-plug through which the rod *a* passes, but no stuffing-box is necessary at this end of the cylinder.

e is the lower suspender.

e' is the upper suspender.

f is the lower lea-supporting roller.

f' is the upper lea-supporting roller.

g is a rod connected with the upper suspender, which, projecting upwardly, engages with a threaded nut *h*, which is supported upon a threaded spindle *i*. Both of these devices are supported upon a lever *j*, which is pivoted at *k* to the base B. The spindle *i* is threaded and is adapted to be rotated upon its axis, whereby the nut *h* will be moved longitudinally of the lever *j*, thus adjusting the leverage.

l is a link connecting the lever *j* with an open-topped piston *m*, which is provided with a little clap-valve *n*, which closes a small opening through the piston *m*.

o is a cylinder to the lower end of which a pipe *p* is attached, which connects with the indicator *q*, which is provided with an index-dial *r*.

s is a check-valve which, as in ordinary hydraulic indicators, is preferably provided with means of mitigating the reaction consequent upon the breakage of the material being tested. Such means may be the permission of a little leakage, as is usual in such apparatus.

t t are two brackets extending from the lower end of the cylinder V, which support an axis *u*, upon which turns a flanged roller *v*.

w is a similar flanged roller supported in the bifurcated end *a'* of the rod *a*.

b' is a strap, chain, cord, or equivalent material which is fastened, as at *c'*, to any suitable support, which passes under the flanged roller *w* and over the flanged roller *v*, and upon its lower end has suspended a stirrup *d'*.

Before describing the devices shown in Figs. 4 to 7, both inclusive, I will state the operation of the mechanism thus far described.

The spring D is made of such strength as necessary to break the materials up to the limit of the indication on the dial of the machine.

e'' (see Fig. 2) is a little screw-plug which closes a small hole made in the cylinder C, so located as to permit the drawing off of the air from under the piston, so as to insure the apparatus being replete with liquid only.

Any suitable liquid, preferably a glycerin preparation, is poured into the cylinder V, through any suitable opening, when its piston *b* is at its lowest point, and the filling is continued until the cylinder V is full or substantially so. Of course, in so doing, a certain portion of the liquid will have passed through the tube U and entered the cylinder C. Thereupon the operator puts one foot in the stirrup *d'* and applies his weight thereupon, which, through the instrumentality of the parbuckle *b'*, *v*, and *w*, or other equivalent mechanism, causes the piston *b* to rise through the cylinder V, expelling the liquid from it through the tube U into the cylinder C, upward through the diaphragm K, unseating the valve J and compressing the air below the piston E. The piston is consequently elevated, the spring D being compressed. When the piston reaches a point at or above the screw-plug *e''*, (a petcock or other equivalent device may be employed instead of it,) then such petcock or screw-plug is loosened and the air allowed to escape until clear liquid spurts through the opening, thus indicating that all the air has been expelled. Thereupon the petcock or screw-plug is closed, and the foot-pressure being removed from the stirrup *d'*, the valve J immediately closes, confining all the liquid above it and holding all parts in their then position.

The elevation of the piston-rod *a* has moved the suspender *e* toward the suspender *e'*, whereupon the skein or lea of cotton, which has previously been prepared upon a wrap-reel, is applied to the rollers *f* and *f'*, they being temporarily removed from the suspenders by opening them upon their pivots, they being made in two parts pivoted together, as shown in Fig. 3, for this purpose. The rollers are then replaced in the suspenders and the threads of the cotton being accurately arranged, and the two ends suitably secured, the operator determines the speed at which he wishes the strain to be applied, in other

words, the rapidity of the descent of the lower suspender *e*. Having determined which, he puts the pin S in the proper hole in the quadrant-plate Q, and thereupon swings the lever P over until it rests against and is held by the pin, and the swinging of the lever rocks the shaft O, to which it is attached, and of course actuates the cam N, which by reason of the engagement of the valve-spindle M with it elevates the valve J more or less, as the case may be, consequently separating that valve from its seat by a greater or less distance, which permits the liquid above the valve to pass downwardly through the perforations in the valve-seat with greater or less rapidity, thus permitting the spring D to exert its force hydraulically, it being transmitted through the liquid contained in the two cylinders and in the connecting-tube U upon the upper surface of the piston *b* in the cylinder V, whereby the lower suspender with its roller *f* is forcibly moved downwardly through the instrumentality of the connecting-rod *a*, and thus the strain be applied upon the cotton stretched between the two rollers *f* and *f'*. The downward strain is transmitted through the connecting-rod *g*, threaded spindle *i*, lever *j*, link *l* and piston *n*, hydraulic cylinder *o*, and thence through the pipe *p* to the indicator, as usual.

I call particular attention to the following, because it is the essence of my invention.

It will be observed that although the speed at which the strain is applied may be very greatly varied, depending upon which of the holes in the quadrant-plate the pin is placed, nevertheless that the movement of the parts must be absolutely the same at each use of the apparatus—that is to say, the lower suspender with its roller *f* will descend just so far in a given time at the commencement of the operation and the same at the conclusion of it when the material breaks. This descent may be at the rate of a foot in a quarter of a minute, or a foot a minute, or in an hour, depending upon which hole of the quadrant-plate the pin is placed. In fact there is no limit in this regard. If the valve J is so set through the instrumentality of the lever P and the pin S, so that the liquid above the valve will merely ooze through the opening in its seat, then it may take several hours before the lower suspender has descended the necessary distance, and, on the contrary, the valve may be so set as that it will travel the stated distance in a few minutes. In fact my instrument removes the personal equation entirely from the act of testing. The operations are purely mechanical and automatic.

My apparatus also has the advantage that it can be readily put in registration with or adjusted to any given power apparatus, which is frequently a matter of great convenience. Assuming, for instance, that in the factory there is a power-testing machine which moves at a given speed, then the owner can immediately adjust his little machine in his office, which may be somewhat removed, or in his store, in a different place, to the same speed.

Referring now to drawings 4 to 7, inclusive, they illustrate devices which take the place of the rollers *f* and *f'* when the material to be tested is woven cloth instead of yarns or threads. The suspenders *e* and *e'* are the same as before, excepting that the openings in the ends of the jaws are squared instead of round, so that there can be no rotation of the part which holds the fabric, and instead of the rollers I provide metallic cylindrically-shaped pieces *h'*, which have square axes *i'* at each end, and a slot *j'* is cut through these blocks, not quite, however, to their ends.

k' is a short section of a rubber tube, preferably an ordinary rubber hose, one end of which is clamped by a plate *l'* and screws *m'* to the cylindrical blocks *h'*, the other end being left free. Now to apply the end of the piece of fabric to be tested to these devices the piece of hose is swung away from the cylindrical blocks *h'*, as shown in Figs. 4 and 6, and the end of the piece of fabric is passed through the slot *j'* and is thence bent up over its upper arc and it is impaled upon two or more prick-points *n' n'*, which are set in the periphery of the cylindrical blocks, which are merely for the purpose of holding that edge of the piece of fabric. The fabric is shown at *x*. After the edge has been impaled upon the prick-points *n'*, then the rubber flap *k'* is bent upwardly and envelops the end of the fabric, as shown in Fig. 5, thereupon the free end of the fabric is swung over the end of the rubber flap, as shown by the arrow in Fig. 4, and brought downwardly, as shown in Figs. 5 and 6, and it will be observed that the strain which is applied to it will cause the free end of the rubber flap to hug down with greater and greater closeness upon that portion of the fabric which rests over the upper arc of the cylindrical blocks *h'* and absolutely preclude its slipping.

The lower end of the piece of fabric is attached to the lower holding device in the same manner, excepting that the relative position of the parts is reversed, because at one end the pull is down, and at the other up.

I do not limit myself to the details of construction described and claimed, for it will be evident to those who are familar with this art that modifications in such details may be made without departing from the essentials of the invention.

I claim—

1. The combination in a testing-machine of a cylinder containing a piston, a spring interposed between one end of the cylinder and the piston, a hydraulic piston contained within a cylinder, a passage connecting the two cylinders, and means whereby the liquid may be initially expelled from the cylinder containing the hydraulic piston into the other cylinder, and the tension of the said spring thus increased, for the purposes set forth.

2. The combination in a testing-machine, of a spring-actuated piston, a hydraulic piston, a cylinder for each, a passage connecting the cylinders, means whereby the liquid may be initially expelled from the cylinder containing the hydraulic piston into the other cylinder, and the tension of the spring thus increased, a valve for controlling the spring, and means for regulating the said valve, for the purposes set forth.

3. The combination in a testing-machine, of a spring-actuated piston and a hydraulic piston, a cylinder for each, a passage connecting the cylinders, means whereby the liquid may be initially expelled from one into the other, and the tension of the spring thus increased, a valve for controlling the spring, and adjustable means for regulating the valve, for the purposes set forth.

4. The combination in a testing-machine of a spring-actuated piston contained in a cylinder, a chamber for liquid beneath the piston, means to force liquid into the cylinder in front of the piston, thus putting the spring under tension, and a valve for controlling the operation of the spring, for the purposes set forth.

5. The combination in a testing-machine, of a hydraulic cylinder, a piston, a piston-rod which projects beyond both ends of the cylinder, a wheel on one end of the rod, and a device for holding the material to be tested upon the other, for the purposes set forth.

6. The combination of a spring-actuated piston contained within a cylinder, a hydraulic cylinder, means to expel the liquid from the latter into the former, in front of the piston, and thus increase the tension of the spring, a valve to control the action of the spring, and means to support the material being tested, one connected with the hydraulic piston and the other acting upon a registering device, for the purposes set forth.

7. In a testing-machine, the combination of two cylinders, one containing a spring-actuated piston and the other a hydraulic piston, a valve controlled from the exterior, for regulating the action of the spring, a piston-rod for the hydraulic piston projecting from both ends of the cylinder, one end having means for independently moving the said piston, and the other carrying one of the supports for the material to be tested, for the purposes set forth.

8. In a testing-machine, a holding device for the material to be tested, embodying angular surfaces for engagement with the material, a slotted body part and a flap of flexible material, arranged substantially as described, for the purposes set forth.

9. In a testing-machine, a holding device for the material to be tested, embodying a slotted body-piece having a curved exterior surface, a flap of flexible material attached thereto, and prick-points for initially holding the material, for the purposes set forth.

Signed at New York, in the county of New York and State of New York, this 11th day of February, A. D. 1896.

MARK H. TOMKINS.

Witnesses:
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A. B. MORRISON.