Oct. 22, 1935. A. R. ARTHUIS 2,018,593

MACHINE FOR TESTING METALS AND OTHER SOLID MATERIALS

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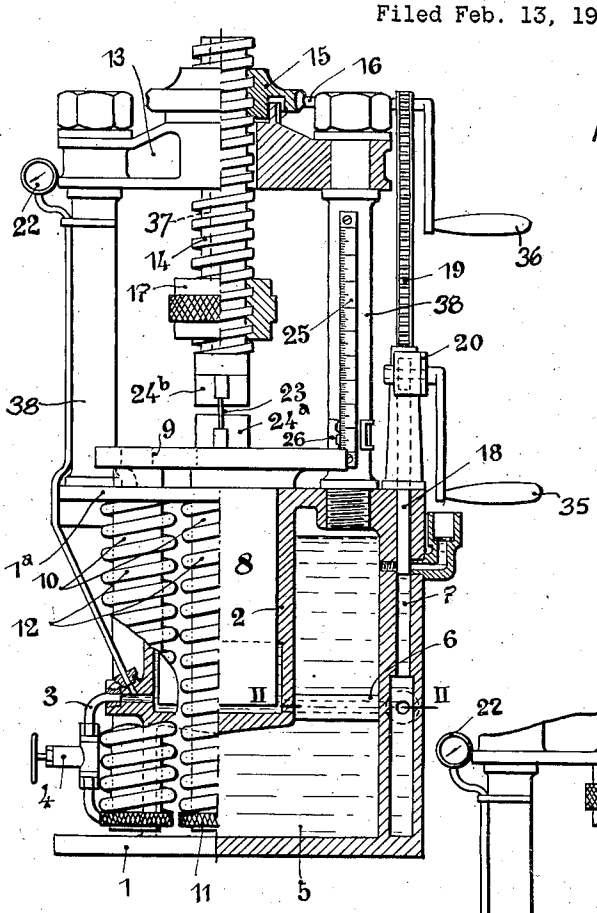

Fig. 1

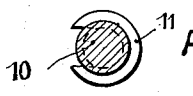

Fig. 4

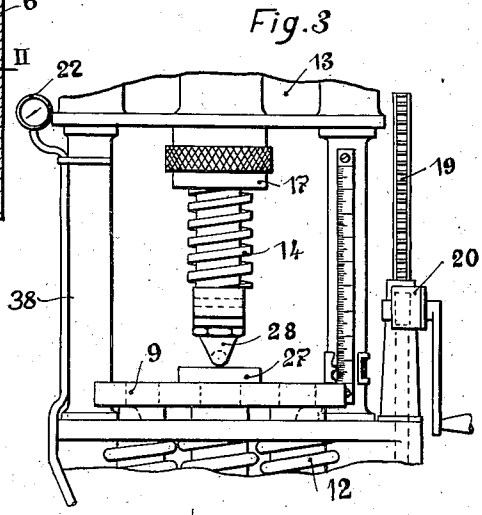

Fig. 3

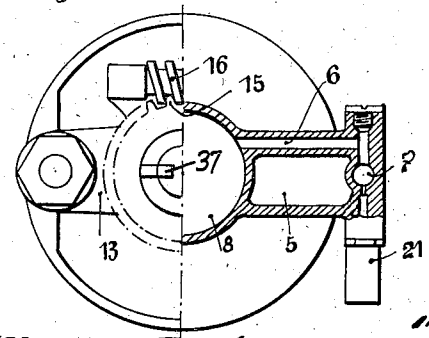

Fig. 2

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MACHINE FOR TESTING METALS AND OTHER SOLID MATERIALS

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Application February 13, 1934, Serial No. 711,061
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4 Claims. (Cl. 265—18)

The invention refers to a machine for testing metals and other solid materials by tension and by compression without any other modification than the change of the pieces in contact with the samples to be tested.

The invention is characterized by the combination and arrangement into a single machine of two known devices:

The first is a machine with springs for testing metals.

The other is a hydraulic press. The two devices coact and complete one another, allowing thereby the addition to the new machine of a hydraulic braking system for the relief of the springs. Such adjunction of the hydraulic brake is of the highest importance owing to the fact that in the spring machines, the releasing of the same by the breaking of the sample is so violent that the machine is often brought out of use before the proper time.

In the drawing:

Fig. 1 shows the machine half in elevation and half in section ready for the tensile test.

Fig. 2 is a plan view with a half section on the line II—II of Fig. 1.

Fig. 3 is a partial section of the same machine equipped for compression test.

Fig. 4 is a detail showing the shape of the stop rings.

This machine includes a frame 1 bearing the cylinder 2 of a hydraulic press connected by a pipe 3 provided with a closing device 4 to a tank 5 for the fluid. The said cylinder is furthermore in connection by a channel 6 with a second cylinder 7.

The cylinder 2 has a piston 8 with a top plate 9. To the underside of the plate 9 are fixed a plurality of cylindric cores 10 to form an annular series around cylinder 2 and extending towards the lower part of the machine and provided at their free ends with detachable stops 11 on which rest springs 12 at their other ends against the under side of fixed table 1a of the frame.

The top beam 13 has working therein a screw 14 receiving an up and down motion without rotation by means of a gear wheel 15 and worm 16 which are operated by a crank lever 36.

The screw 14 bears a movable nut 17 adjustable so as to control the movement of the screw 14. Said screw has a longitudinally extending slot 37 in one side thereof for receiving a lug (not shown) carried by said frame 13.

In the cylinder 7 is a piston 18 which is moved by the operation of a rack 19 driven by means of a pinion 20 and a crank lever 35.

This device is intended to raise progressively the pressure within the cylinder 2 by forcing the fluid thereinto. This pressure is automatically limited by an adjustable outlet valve 21, 22 being a pressure gauge connected to pipe 3 and is responsive to pressures in cylinder 2.

The operation of the machine is as follows:

Tensile tests

The test piece 23 which is made up according to a suitable form for the said trials is held at the same time by an integral member of the plate 9 of the piston 8 and by a piece fixed to the screw 14, such as 24a and 24b showing the pieces used in a tensile test. The test piece 23 is held thereto by any known engaging means.

With the rising of the screw 14 by means of the members 15 and 16 there is also lifted at the same time, through the medium of the test piece 23, the piston 8. The liquid in tank 5 having its level higher than the bottom of the piston 8 will, by the force of gravitation, tend to create a common level in both tank 5 and cylinder 2. Therefore, the level of the liquid will tend to follow the rise of the piston 8.

The upward motion of the piston also causes the compression of the springs 12, thus effecting a stronger tension on the test piece 23. When this piece is breaking in the tensile tests, the compression taken by the springs and indicated on a scale 25 by a slider 26 moved by the plate 9 gives the indication of the tensile strength.

For the tensile tests, the deformations of the test piece may be recorded in the form of a diagram by means of a known device.

At the right moment of the rupture of the test piece 23, that is at the highest point of compression of the springs 12, the relief of the springs is hydraulically braked.

In fact the rise of the piston has caused the liquid to come into the cylinder 2, in a similar manner to the piston in a pump barrel, so that the springs 12 which are dependent upon the piston 8 through their core 10 can unbend only according to the outlet of the liquid of the cylinder 2 through the pipe 3 under the pressure of the piston, with the result that the breaking of the test piece is quiet and without any violent shock. The valve 4 is open for this test. The fixed table 1a is rigidly spaced from the top beam 13 by means of a pair of uprights 38. One of these uprights 38 has mounted thereon a scale 25. A slider 26 is slidably mounted upon

the upright 38 having mounted thereon the scale 25 and the point of said slider 26 rides upon the said scale 25.

Compression tests

In this case, the cylinder 2 is disconnected from the tank 5 by the closing of the valve 4. The test piece 27 is arranged on the piston plate 9, and the lower part of the screw 14 supporting either a plate or a ball holder 28 is brought in contact with the same.

The movable nut is then moved up to the lower face of the beam 13. By acting on the plunger 18, the piston 8 rises and exerts a compression force on the testing piece 27. In the compression tests the force may be increased up to the breaking of the test piece.

Having now described the objects of this invention and in which manner the same is to be performed, what I claim is:

1. A machine for testing specimens comprising a frame having a reciprocable means at one end and a means at the other end comprising a cylinder, a reservoir in communication with said cylinder, a stop cock therebetween, a hydraulic pump in communication with said cylinder, a piston in said cylinder, springs connected to said piston, means for mounting a test specimen in connection with the reciprocating means and the said second means, a scale mounted on said frame, and a pointer mounted on said piston so as to move along said scale.

2. A machine for testing specimens including in combination a frame, a cylinder, a piston therein acting as either a shock absorber or hydraulic press, spring retaining means attached to said piston, springs attached thereto and abutting against said frame, a reservoir in communication with said cylinder, a stop cock therebetween, a hydraulic pump in communication with said cylinder, a screw mounted in the top of said frame, means for reciprocating said screw, means on said piston and said screw for mounting a test specimen in connection therewith, a scale mounted on said frame and a pointer mounted on said piston so as to move along said scale.

3. A machine for testing specimens including in combination a frame, a cylinder, a piston therein acting as either a shock absorber or a hydraulic press, spring retaining means attached to said piston, springs attached thereto and abutting against said frame, a reservoir in communication with said cylinder, a stop cock therebetween, a hydraulic pump in communication with said cylinder, a screw mounted in the top of said frame, a gear wheel mounted on the top of said frame and said screw, said gear wheel being interiorly threaded so as to move on said screw, a worm rotating said gear wheel, a crank, a rack, a pinion, said crank operating said hydraulic pump by the operation of said rack through said pinion, a second crank rotating said worm gear, means on said piston and said screw for mounting a test specimen in connection therewith, a scale mounted on said frame and a pointer mounted on said piston so as to move along said scale.

4. A machine for testing specimens including in combination a frame, a cylinder, a piston therein acting as either a shock absorber or a hydraulic press, a plate mounted on said piston, a plurality of cores mounted on the under side of said plate, springs mounted on said cores, detachable stops retaining said springs thereon, said springs being retained from upward movement by said frame, a reservoir in communication with said cylinder, a stop cock therebetween, a hydraulic pump in communication with said cylinder, a screw mounted in the top of said frame, a gear wheel mounted on the top of said frame and said screw, said gear wheel being interiorly threaded so as to move on said screw, a worm rotating said gear wheel, a crank, a rack, a pinion, said crank operating said hydraulic pump by the operation of said rack through said pinion, a second crank rotating said worm, means on said piston and said screw for mounting a test specimen in connection therewith, a scale mounted on said frame and a pointer mounted on said piston so as to move along said scale.

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