





# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN RECORDING PRESSURE-GAGES.

Specification forming part of Letters Patent No. **106,345**, dated August 16, 1870.

*To all whom it may concern:*

Be it known that I, JARVIS B. EDSON, of Brooklyn, Kings county, New York, have invented new and useful Improvements in the Construction of Recording Pressure-Gages; and that the following is a full and exact description of the same, reference being had to the drawing accompanying and making part of this my specification.

The object of these improvements is to ascertain and mark the extent and variations of pressure in steam-boilers, steam-cylinders, or any other vessels containing air, gas, or liquids under pressure by delineations upon a chart, either operated automatically by the pressure to be measured or driven by gearing from an engine.

My invention consists, first, in a new manner of constructing and arranging diaphragm elastic springs or chambers, in which the pressure acts; secondly, in the mechanical devices by which the action of the springs is adapted to recording the pressure separately or in connection with the motion of an engine by lines upon the moving chart.

In the accompanying drawing, Figure 1 represents a front elevation of the instrument, a portion of the same being removed to show the interior parts. Fig. 2 represents a top view of the same.

Similar letters represent similar parts of the figures in the drawing.

The first part of my invention, which has reference to the means by which the pressure is received, and thereby communicates the desired movement to the instrument, consists in the new manner of constructing and arranging the diaphragm-springs. These springs consist of a series of circular elastic chambers. They are composed of thin steel circular disks, with or without corrugations, each pair forming a separate chamber, by means of a flat brass or composition ring, interposed between thin outer edges, and two compressing-rings, above and under the interposing ring, and which are secured together by screws or any suitable fastenings, so as to be steam and air-tight.

The elastic chambers are shown in Fig. 1 in section, the pairs of elastic plates at *a*, the in-

termediate separating-ring at *b*, and the compressing-ring at *c*.

The chambers are connected together by a hollow connection, secured to the centers of the plates around an opening, and they are provided with alternate male and female screw-threads, so as to be connected together in a series, the joints being steam and air tight. These screw-connections are shown at Fig. 1 at *d*.

The lower chamber is secured to the bed-plate, and is provided with a coupling, *d*<sup>1</sup>, by which connection is made, through a suitable pipe, with a boiler or other reservoir containing the pressure. The upper chamber has on the top plate a short fixed vertical stud, *d*<sup>2</sup>. These chambers are placed in a suitable frame or casing, *e*, of brass or other material, which forms a bearing for the operating mechanism, and is secured by screws through a flange at the base to the bed-plate *f*.

The second part of my invention applies to the mechanism for operating the moving chart and recording-pencil or tracing-point, and is constructed as follows: Upon a suitable bearing, *G*, on the upper part of frame *E*, is the segmental rack *h*, oscillating vertically on the pivots *i*, and having on its outer segmental periphery teeth which gear into the pinion *j*, fast to the horizontal shaft *k*, on the front end of which is fixed the spur-wheel *l*, and on the opposite end the smaller spur-wheel *m*, which gears into the horizontal sliding rack *N*, which, passing through slots in the frame *E*, extends outside the same in opposite directions.

Upon the side of the segmental rack *h* is fixed the open rectangular frame or shoulder *O*, within which is arranged the sliding adjustable link *p*, and which is made to slide toward or from the center of oscillation of the segmental rack *h* by means of the two adjusting-screws at the opposite ends, the points of which work in suitable sockets in the link *p*.

The connecting-rod *a*<sup>2</sup> is, at its upper end, pivoted upon a pin fast in the link *p*, and at its lower end is fastened by a pin to the stud *d*<sup>2</sup>. The use of the sliding link *p* is to increase or diminish the extent of oscillation of the segmental rack *h* and the range of the parts which it puts in operation.



R is a reservoir-drum, upon which the paper chart is wound. Its bearings are upon conical points in corresponding sockets in the center of the drum-heads, the lower being fixed in the bed-plate, the upper bearing being an adjustable thumb-screw,  $r^1$ , which passes through the horizontal bracket  $r^2$ , attached to the back of the frame of the instrument.

Upon the opposite side of cylindrical casing  $e$  is the receiving-drum S, which has its lower bearing similar to that of drum R, and above in a raised bearing on the top of the drum-head. These drums have a narrow slot passing through their length, into which is fitted an eccentric-rod, so as to hold the paper and prevent its slipping, as shown at  $S^1$ , Fig. 2.

Around the edge of the upper head of drum S is a raised rim, making within a hollow circular space, in which is placed the universal pawl  $t$ , which is centered upon the central bearing  $t^1$ , fast upon the drum-head.

The short arm  $t^2$  of the pawl  $t$  is so eccentrically arranged that its outer end will, when the pawl is pushed forward, always catch upon the inner surface of the raised rim on the drum-head, and thus produce rotary movement to the drum S, while the movement of the pawl backward in the opposite direction does not produce any motion of the drum, the arm  $t^2$  sliding backward without producing any impingement upon the rim.

The additional pawl  $u$  is provided as a brake, to prevent the recoil of the drum. The pawl  $t$  is operated at its outer end by the fixed pin in the end of horizontal rack  $n$ . The paper chart, of any desired length, wound around the drum R, is passed in front of the bearing on the casing E, and thence to the receiving-drum S, after receiving the delineation of the pencil.

The paper chart is shown in Fig. 2 at  $v$ , and moves in the direction indicated by the arrows, and it is also shown in Fig. 1 on both the drums, and on the part of Fig. 1 which shows the removed portion of Fig. 1, the chart being marked with graduated horizontal parallel lines, figured so as to show the degree of pressure.

In front of the cylindrical shell E is the vertically-sliding rack  $w$ , in suitable bearings upon E, the teeth of the rack  $w$  meshing into those of the spur-wheel  $b$ , above described, and by which the rack is operated.

In front of the rack  $w$ , and parallel with it, is the spring pencil-holder  $x$ , which is joined at its upper end to projecting stud fast upon the rack  $w$ , and is pressed inward by the spring, thus keeping the pencil close upon the chart, which moves between it and the bearing upon the frame E.

The operation of the above-described apparatus is as follows: Pressure from the steam-boiler or other vessel sustaining pressure being introduced into the diaphragm-chambers through the coupling  $d^1$ , the plates expand

and raise the rod  $a^2$  on the upper plate of the topmost chamber. This upward movement raises the segmental rack, which, at the same time, carries the rack  $n$  in the direction of the receiving-drum S, and, by its connection with the pawl  $t$ , the reverse movement of the rack, caused by decrease of pressure, rotates the drum S.

When the tracings are to be upon unsized paper, the pencil may be of lead; but when cards are to be taken on what is called "metallic paper," for any specific purpose, a metallic point must be used in a holder adapted to the purpose. These tracings will be, as shown, of vertical and oblique lines; but when drum S is operated by gearing from an engine, the delineations will not be confined to vertical and oblique lines, but more continuous.

I connect an alarm apparatus with the above-described mechanism, for the purpose of giving notice when any determined limit of pressure is reached.

The hammer of the alarm apparatus is shown at I, and the bell or gong 2 is placed over the cylindrical casing E. The tripping of the hammer is produced by the action of a pin in the end of the rack  $n$ , which is set in the rack so as to be adjustable at any point in the movement of the rack, which will give the alarm at high pressure.

By the operation of my improvements and invention, as above described, a written record, which is unerring and continual, is produced automatically, showing the pressure and changes of pressure within a steam-boiler or other vessel sustaining pressure, and which records are valuable and useful, as well for scientific as for practical purposes; and the apparatus is made to give an alarm when the pressure has arrived at a point to be dangerous, the tendency of this recording instrument being to prompt all in charge of boilers to a more faithful performance of duty, whereby greater safety to life and property is secured.

This apparatus, being compactly arranged, is inclosed in a metal box, having a glass in front, through which the tracings may be observed, and which case or box may be locked, when desired, for particular purposes.

Having thus described my improvements and the construction and operation of the same, what I claim therein as my invention, and for which I desire Letters Patent, is as follows:

1. The combination of the springs  $a a a$ , the connected rod  $a^2$ , the oscillating segmental rack  $h$ , the adjustable sliding link  $p$ , the pinion  $j$ , the shaft  $k$ , the spur-wheels  $l$  and  $m$ , for operating the racks  $w$  and  $n$ , the paper-carrying-drums R and S, and the alarm-movements 1 and 5 with the spring recording-pencil X, as shown and described, whether put in motion by any fluid or liquid under pressure, or in part operated by gearing to an engine.
2. The cylindrical frame (inclosing the



springs) and its interior bridge *g*, which affords a firm and substantial bearing for the segmental rack *h*, supporting the adjustable link *p*, to which the upper end of the connecting-rod *a*<sup>2</sup> is attached, and upon which it depends for support, and to protect the spring-connections from injury and vibratory strain from the constant jarring of a locomotive,

while the front of said frame *E* affords a suitable bearing for the rack *w* and the paper chart when receiving records or delineations of pressure.

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Witnesses:

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