

G. H. CROSBY.
Pressure Gages.

No. 145,726.

Patented Dec. 23, 1873.

Fig. 1.

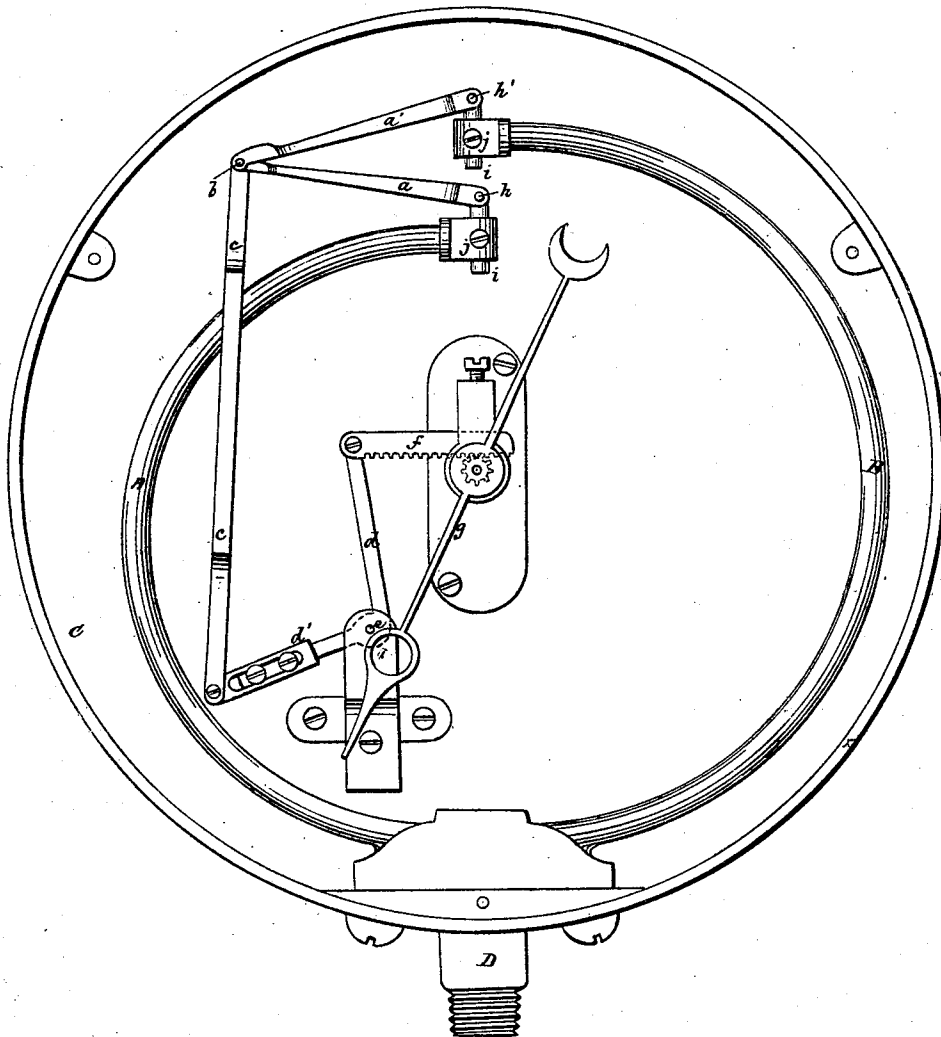
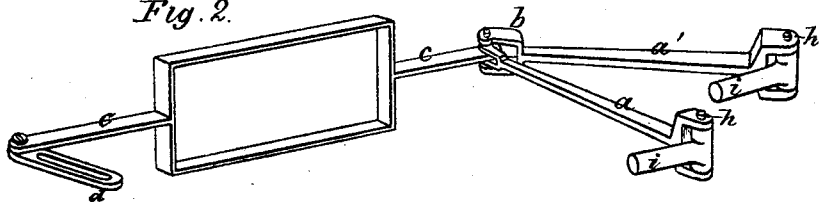


Fig. 2.



Witnesses.
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by his atty *Shook*

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Fig. 3.

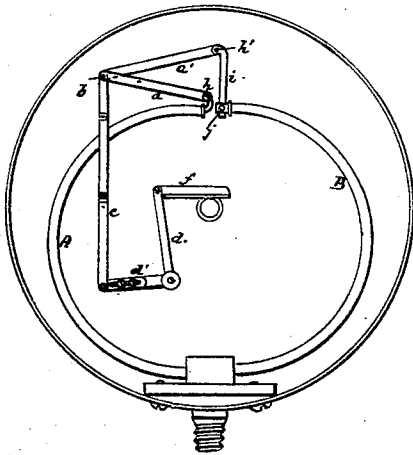


Fig. 4.

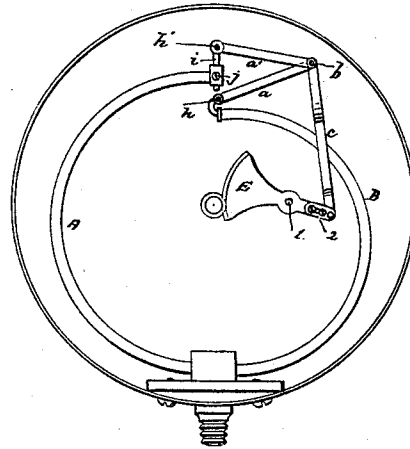


Fig. 5.

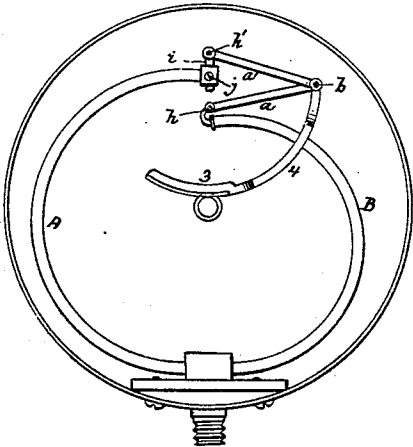


Fig. 6.

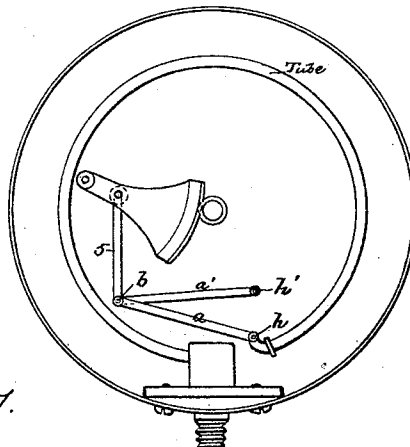
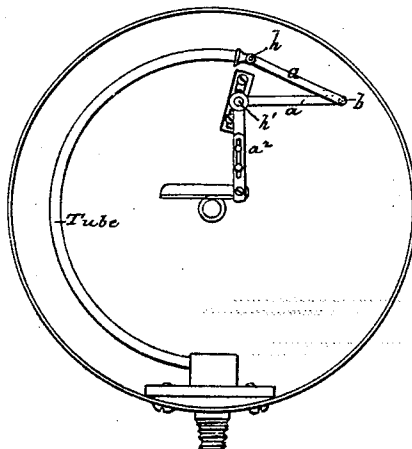


Fig. 7.



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UNITED STATES PATENT OFFICE.

GEORGE H. CROSBY, OF EAST SOMERVILLE, MASSACHUSETTS.

IMPROVEMENT IN PRESSURE-GAGES.

Specification forming part of Letters Patent No. **145,726**, dated December 23, 1873; application filed August 6, 1873.

To all whom it may concern:

Be it known that I, GEORGE H. CROSBY, of East Somerville, Middlesex county, Massachusetts, have invented certain new and useful Improvements in Vacuum or Pressure Gages, of which the following is a specification:

My invention relates to gages in which the Bourdon tube is used as the means of giving movement to the index; and it consists of a new mechanism for connecting and transmitting the motion of the arm or arms of the Bourdon tube to the rack, or equivalent device, for revolving the pinion-shaft that carries the pointer or index, the object I have in view being to utilize, as fully as possible, the upward or vertical, as well as the horizontal, movement of said tube or tubes, thereby throwing its pointer around the graduated dial with the application of less pressure, and consequently with less danger of injuring the tube. I am thus enabled to use a stouter tube for the same pressure than would be the case were I to avail myself of what I have termed the horizontal movement of the tube in contradistinction to the upward or vertical movement of its free end, due to the expansion or straightening out of the tube.

To accomplish this result, I employ two links, connected or joined together at one end, and separately pivoted at their opposite ends, which are spread apart in such manner that the two links constitute the sides of a triangle, of which the point where they are joined or connected together is the apex, and the line drawn between their separately-pivoted ends is the base. In case two Bourdon-tube arms or branches are employed, then one of said links is pivoted to the end of one of the branches, and the other link is pivoted to the other branch. In case but one branch or arm is used, then one of the links is pivoted to the end of this branch, and the end of the other link is pivoted to the case of the gage. With the two links is connected the rack or segment that actuates the index-shaft. In case any portion of the index-shaft-actuating mechanism is pivoted to the case of the gage, then, where two Bourdon tubes are employed, the links should be connected with such pivoted portion of the mechanism by a connecting-rod

jointed at one end to the apex or point of junction of the links, and at the other end to said pivoted portion of the mechanism; but, in case there is no such direct connection with the case of the gage, the jointed intermediate connecting-rod may be dispensed with, the object of this arrangement being both to utilize the two movements of each branch, and also to enable each branch to do its own portion of the work independently of and without interference with the other branch. With the transmitting mechanism intermediate between the Bourdon tube or tubes and the index-shaft are combined means of adjustment, whereby the movement of the tube or tubes may be caused to impart the proper relative motion to the index.

The nature of my invention, and manner in which the same is or may be carried into effect, will be readily understood by reference to the accompanying drawing, in which—

Figure 1 is a plan of a steam-gage, made in accordance with my invention, with the dial removed. Fig. 2 is a perspective view of the links and the connecting-rod which unites them with the angle-lever that carries the rack. The remaining figures, from 3 to 7, inclusive, are diagrams in plan, representing a few of the various modifications of which my invention is susceptible.

In Fig. 1, A B are two branches of a Bourdon tube, secured in case C, and communicating with steam or exhaust pipe D, in the usual way. For the purpose of bringing the two free ends of the branches, the one under the other, I strike the branch A on a smaller circle than the branch B, each branch being slightly more than a half-circle in extent, so as to bring the free end of branch A directly under the like end of branch B. To the head of each tube is pivoted, at *h* or *h'*, a link, *a* or *a'*, the two links being of equal, or nearly equal, length, and united at their other ends by a common pivot, *b*. The two links, under this arrangement, constitute the sides of an isosceles triangle, of which the pivot *b* is the apex. On pivot *b* is mounted a connecting-rod, *c*, which is formed with a loop, as seen in Fig. 2, to straddle branch A, and at its outer end is jointed to the arm *d* of an angle-lever, pivoted at its bend, *e*, to the case, and carrying on its

other arm a rack, f , which rests on the pinion of the indicating-pointer g .

The above-described arrangement of the links a enables me to avail myself fully of the upward movements of the heads of the branches of the Bourdon tube. For instance, supposing the head of the tube A to be moved upward, the separately-pivoted end of the link a of this head would move toward the corresponding end of the other link, and the position of the apex or point b would consequently change, and it would move upwardly in the arc of a circle, having a radius, a^1 , and a center, h' . If, on the other hand, the head of tube B should move upward, then the pivot b would move in a corresponding direction in the arc of a circle, of which a would be the radius, and h the center. As a matter of fact, however, when pressure is applied to the gage, the two tubes will move simultaneously, and, therefore, the movement of the pivot b will be upward, and in a path, and for a distance the resultant of the conjoined movements of the two.

I have here considered only the effect of the upward movement of the tubes. For practice, they expand outwardly away from each other, as well as upwardly, and this outward movement of the two has also its effect upon the links, to cause their pivot b to rise, so that, in reality, the movement of the point b depends upon and is the resultant of the outward expansion, as well as the upward rising, of the heads or free ends of the tubes. It will, of course, be understood that a reverse movement of the links takes place when the gage is used to indicate vacuum instead of pressure, but the principle of action remains unchanged. The movement of the pivotal pin or point b is communicated to the rack through the intermediaries hereinbefore named, as will be understood without further explanation.

The adjustment of the gage can be effected by bringing the pivots h h' nearer together or farther apart, as desired, this being provided for by jointing the links to pins i , which slide in sockets in the heads of the tubes, and are held in place by set-screws j ; or the adjustment may be effected by making the arm d' of the angle-lever in two parts, the one slotted longitudinally and united by set-screws with the other, as indicated in Fig. 1, so that the working length of the arm may be increased or decreased, as desired.

In Fig. 3 I have represented the manner in which the same effect may be obtained from two semicircular tubes struck with the same radius, and with their heads placed end to end. The arrangement of links, connecting-rod, lever, and rack is the same as in Fig. 1, except that the head of one of the tubes B is provided with a sliding pin, i , of considerable length, in order to obtain the needed spreading apart of the pivots h h' .

Fig. 4 represents substantially the same arrangement of the links and connecting-rod, adapted to a toothed segment-rack, E, pivoted

at 1 to the case, and formed on the other side of the pivot with an adjustable and extensible arm, 2, similar to the arm b' of the angle-lever in Fig. 1, to the outer end of which the connecting-rod c is pivoted.

In Fig. 5 an arrangement is represented whereby I dispense with the connecting-rod c , by employing a curved rack, 3, which rests on the pinion of the index-shaft, and is prolonged into a curved arm, 4, looped or divided, like the rod c , to straddle the pressure-tube, and mounted on pivot b . This arrangement is very simple, but none the less effective.

In Fig. 6, the gage represented in the diagram has but a single tube. In order to adapt the links to this gage one of them, a , is pivoted at h , as before, to the head of the gage. The other, a^1 , has its pivotal point h' on the case of the gage. The two points h h' should, of course, be so arranged that they may be brought nearer together or spread apart, and consequently pivot h may be on a sliding rod, i , in the head of the tube; or the pivot h' may be on a bracket adjustable on the gage. The two links are pivoted together, as before, at b , which is also the pivot of connecting-rod 5, joined to a toothed segment-lever midway between the rack or toothed face of said lever and the point 6, where it is pivoted to the case of the gage. Under this arrangement, as a tube constituting nearly a full circle is employed, the links and rod connecting the same with the rack are arranged within the space inclosed by the tube.

In Fig 7 there is but a single tube, struck on a half-circle, or slightly exceeding a half-circle. In this arrangement I employ very nearly the same arrangement of links as shown in the preceding diagram, link a being pivoted at h to the tube, and link a^1 at h' to an adjustable bracket on the case of the gage; but while the link a^1 serves, as before, in conjunction with link a , to regulate and control the movement of the pivot b , it also serves as an intermediary to communicate the movement to the rack, and for this purpose is prolonged beyond pivot h' into an angle-arm, a^2 , which is jointed to and carries the rack. This arm a^2 is, like arm d' in Fig. 1, divided and adjustable. The link thus becomes, in effect, an angle-lever to actuate or transmit movement to the rack.

In all the modifications represented, it will be seen that there is the one feature common to all, of two links jointed together at one end, with their other ends spread apart and pivoted separately, one at least of said ends being pivoted to the Bourdon tube, and connected, through their common pivotal point, with mechanism to operate the index-shaft of the gage, said mechanism, deriving its movement from the changes in position of said common pivotal point; and in all the modifications the vertical movement, as well as the lateral or horizontal movement, of the tube or tubes is fully utilized. In lieu of jointing together the two links at the apex, these ends of the links

may be solidly united, the two thus forming, in effect, a solid V-link, the legs of which are separately pivoted, as before described.

Other modifications might be suggested, but the above are sufficient to indicate the variety of ways in which the invention can be applied.

What I claim as my invention, and desire to secure by Letters Patent, is—

In a pressure or vacuum gage, the means herein described for operating the index-shaft by both the upward or vertical as well as the horizontal movement of the Bourdon tube or tubes, the same consisting of two links joined

or connected together at one end, with their other ends spread apart and pivoted separately, as specified, in combination with intermediate mechanism transmitting the movement of said links to the index-shaft, the whole constructed and operating substantially in the manner shown and set forth.

In testimony whereof I have signed my name in the presence of two subscribing witnesses.

G. H. CROSBY.

Witnesses:

J. H. MILLETT,

WM. W. BURRAGE.

2,000 words.