(No Model.) 3 Sheets—Sheet 1.

C. A. G. WINTHER.

PRESSURE GAGE.

No. 466,547. Patented Jan. 5, 1892.

Fig. 1.

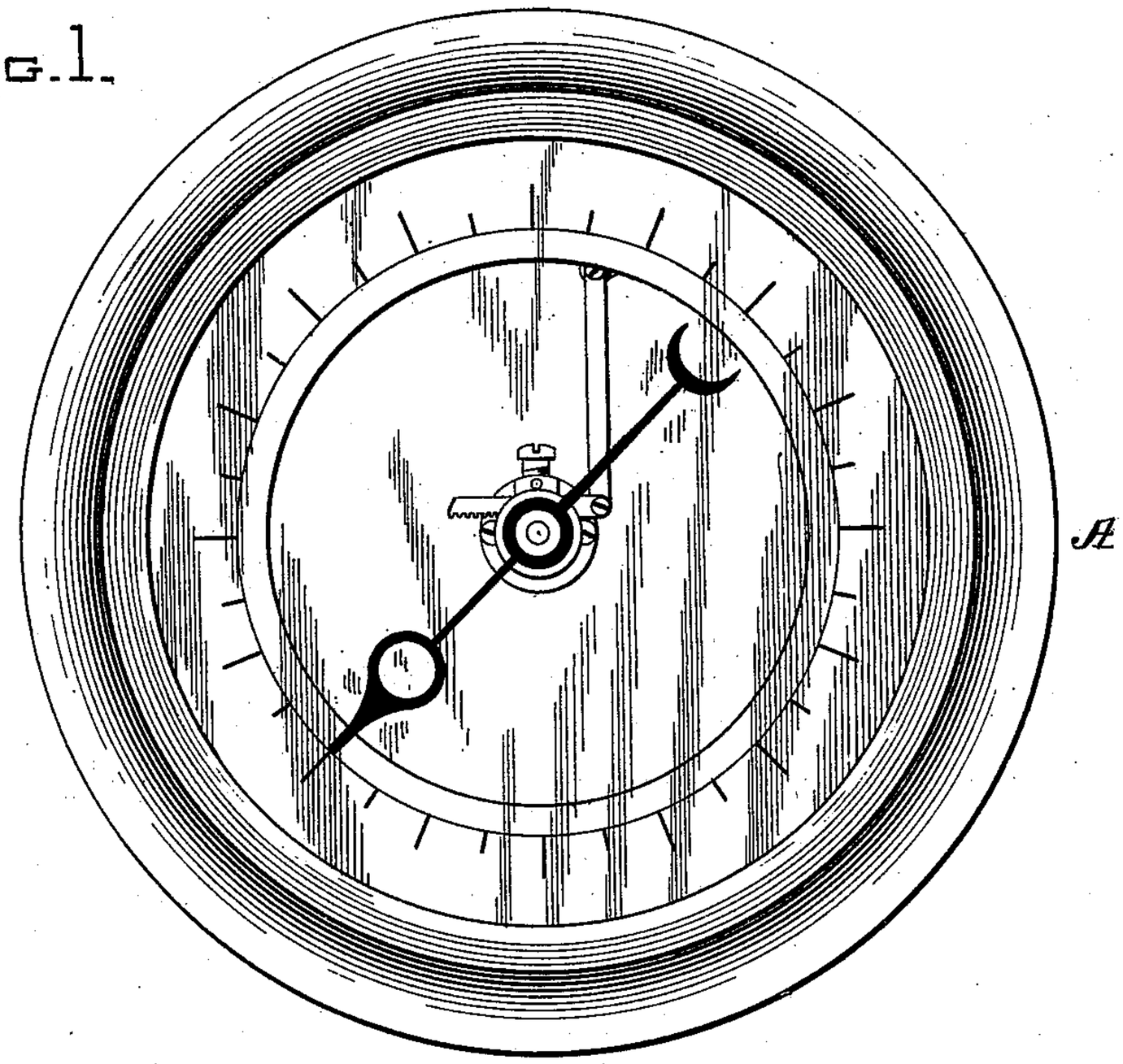
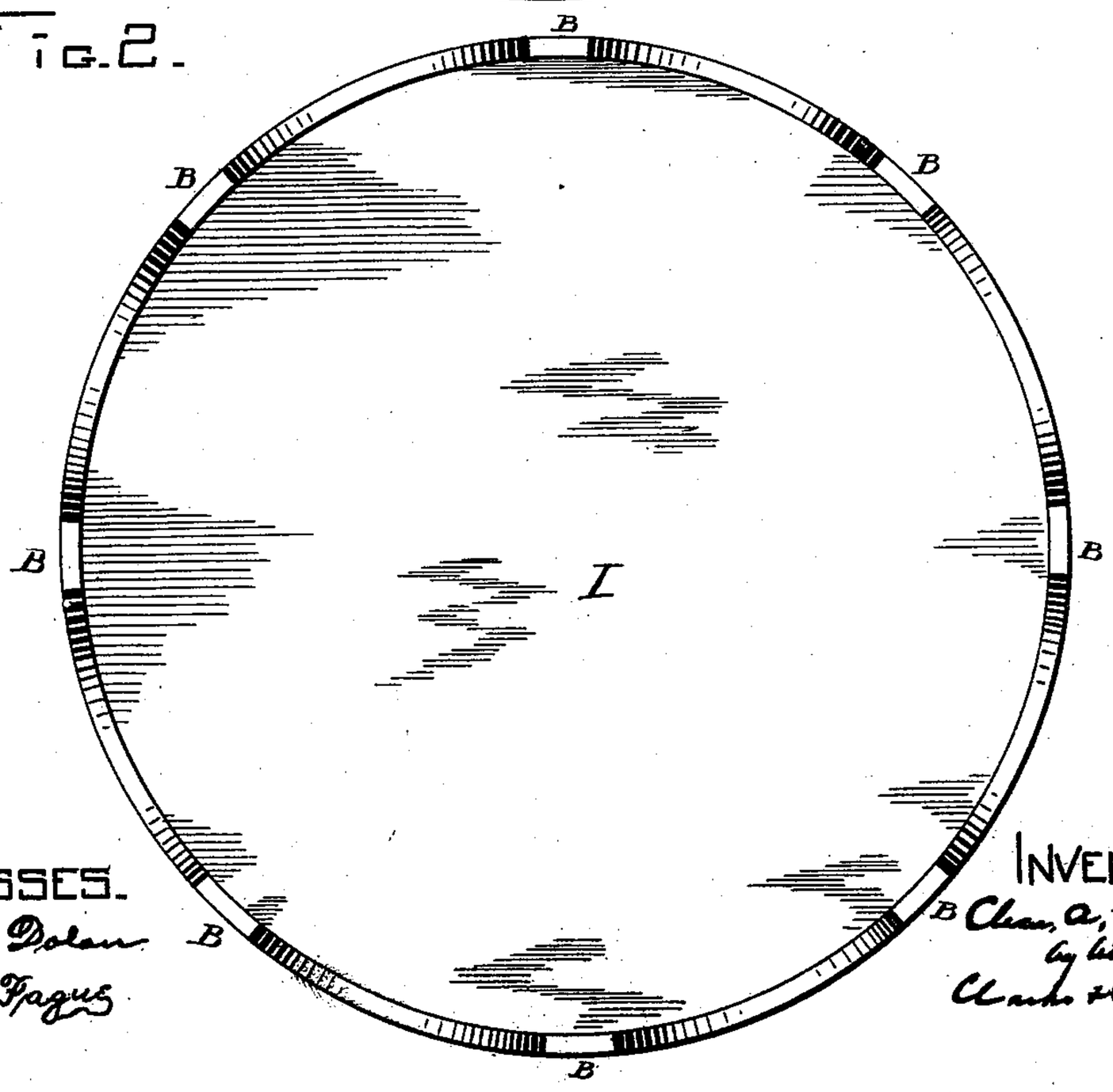


Fig. 2.



WITNESSES.
J. McDolan
W. McFagus

INVENTOR.
Chas. A. G. Winther
by his Attys
Clarke & Raymond

(No Model.) 3 Sheets—Sheet 2.

C. A. G. WINTHER.

PRESSURE GAGE.

No. 466,547. Patented Jan. 5, 1892.

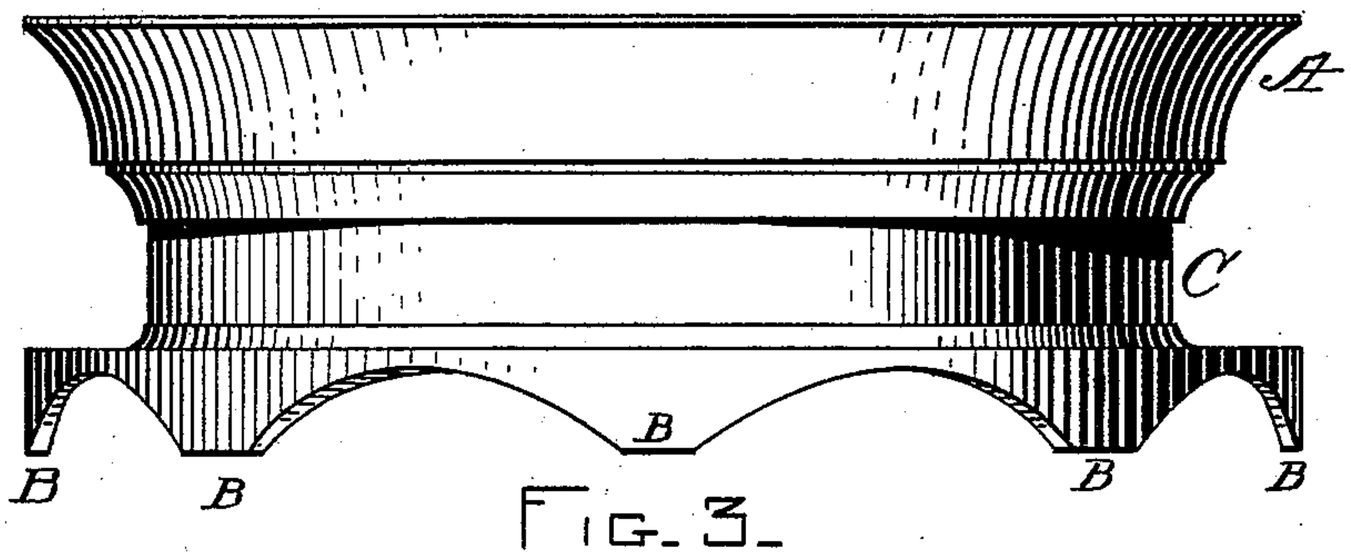
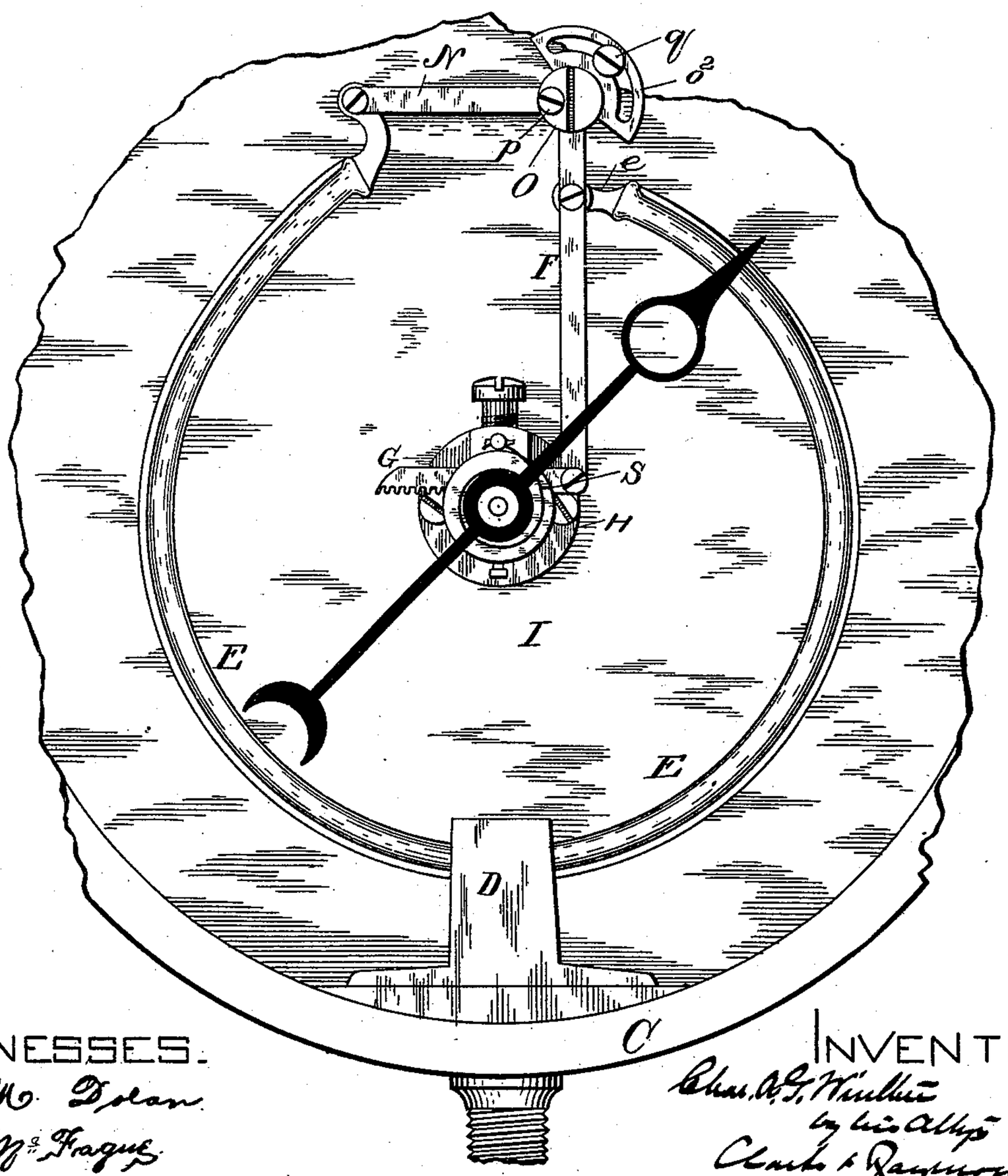


FIG. 3.

FIG. 4.



WITNESSES.

J. M. Dolan

M. M. Fraguy

INVENTOR.

Chas. A. G. Winther

by his Attys

Clarke & Raymond

(No Model.) 3 Sheets—Sheet 3.

C. A. G. WINTHER.

PRESSURE GAGE.

No. 466,547. Patented Jan. 5, 1892.

Fig. 5.

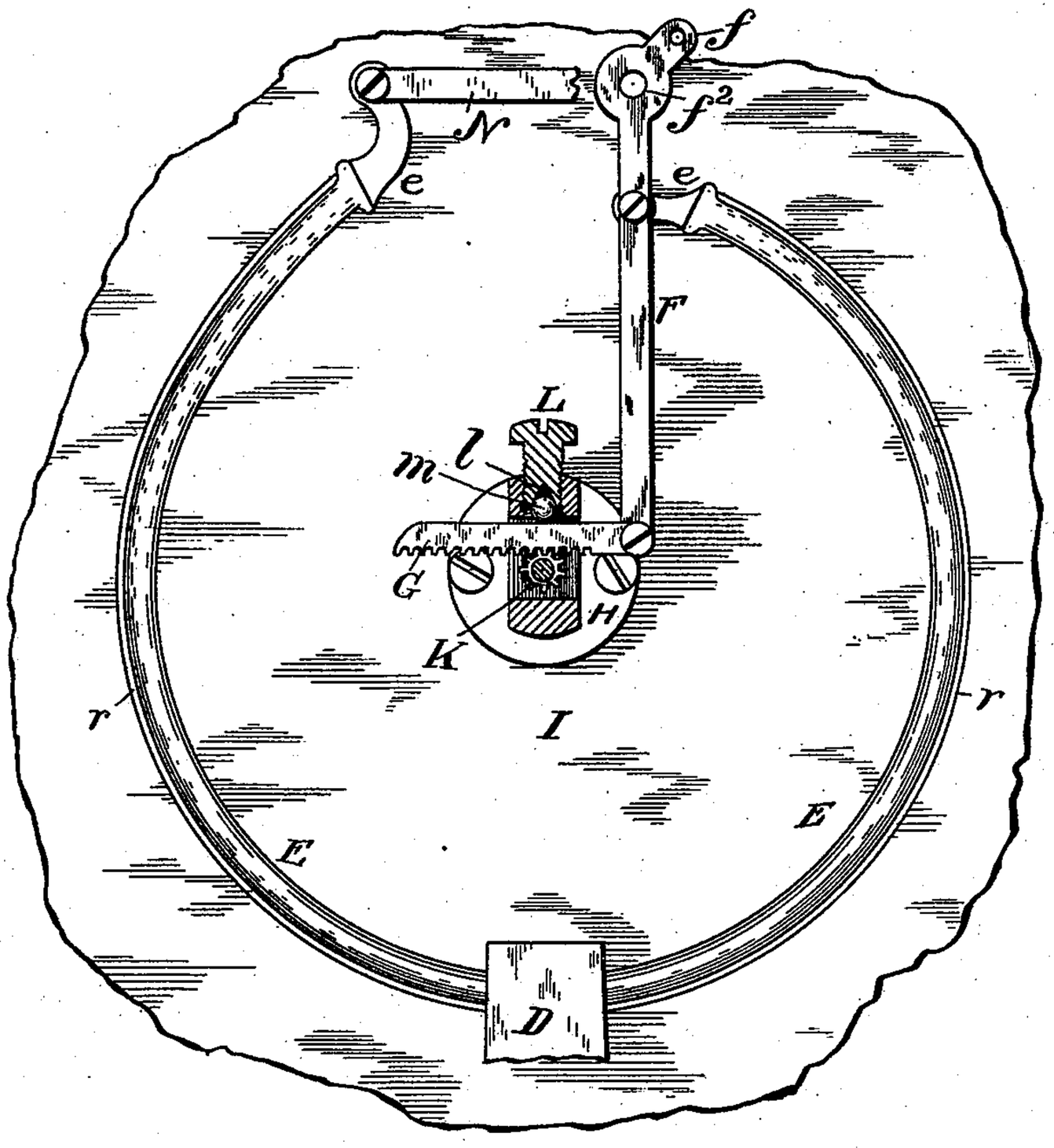


Fig. 7.

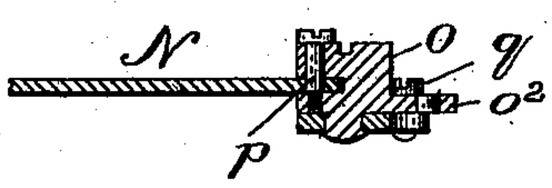


Fig. 6.

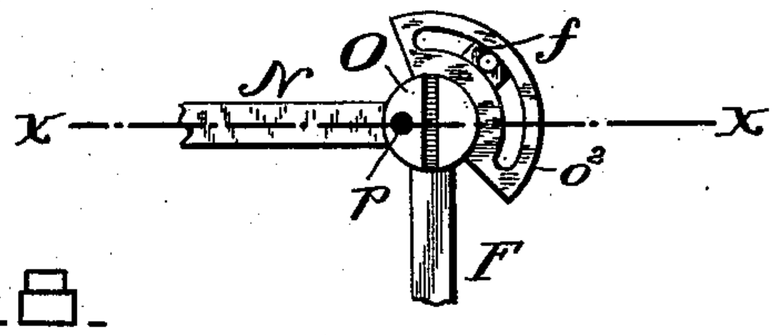


Fig. 8.

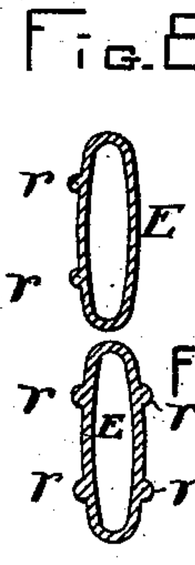


Fig. 9.

WITNESSES.

K. M. Dolan

M. M. Fagan

INVENTOR.

Chas. A. G. Winther

by his Attys

Clarke & Raymond

UNITED STATES PATENT OFFICE.

CHARLES A. G. WINTHER, OF SOMERVILLE, ASSIGNOR OF ONE-HALF TO THE STAR BRASS MANUFACTURING COMPANY, OF BOSTON, MASSACHUSETTS.

PRESSURE-GAGE.

SPECIFICATION forming part of Letters Patent No. 466,547, dated January 5, 1892.

Application filed June 22, 1891. Serial No. 397,064. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. G. WINTHER, of Somerville, in the county of Middlesex and State of Massachusetts, a citizen of the United States of America, have invented certain new and useful Improvements on the Steam-Gage, of which the following, reference being had to the accompanying drawings, forming part of the specification, is a full, accurate, and complete specification sufficient to enable others skilled in the art to make and use my improvement.

In the drawings, Figure 1 is a front elevation of a gage containing these improvements. Fig. 2 is a back elevation of a gage containing these improvements. Fig. 3 is a side elevation of a gage containing these improvements. Fig. 4 is a front elevation of the working parts of the gage, part of the case being broken away. In this drawing the position of the hand does not accurately correspond to the position of the rack and steam springs; but it was thought desirable to show the hand and hair-spring of the gage in this figure, and a position more nearly corresponding with the position of the rack would probably have partially concealed the rack, which it was desirable to show. Fig. 5 is an elevation of some of the working parts of the gage, showing, also, other parts in section and some parts imperfectly. Fig. 6 is a detail drawing of the connection between the spring-actuated lever and the spring-actuated link. Fig. 7 is a transverse section of the part shown in Fig. 6 upon the line X X. Figs. 8 and 9 are transverse sections of the steam-spring.

Like letters indicate like parts in all the figures.

In the drawings, Fig. 3, A is the bezel, which contains the glass front of the gage and which is screwed upon the body of the gage C. This body is continued into a vertical flange, as shown in Fig. 3, which vertical flange is scalloped, as shown in that figure, having downwardly-projecting portions B, as shown in Figs. 3 and 2. The object of providing the body of the gage with a scalloped flange substantially parallel to the pivotal axis of the gage movement is for the purpose of preventing contact between the metallic back of the gage-case and the hot boiler, against which it is customary to erect a locomotive-gage. By thus setting the gage-case off from the boiler by detached "feet," as they may be called, an air-space is provided between the boiler-surface and the case of the gage, which air-space communicates freely with the surrounding air, and hence is kept at a temperature not much in excess of that of the general atmosphere of the locomotive-cab or engine-room, and this arrangement for spacing the back of the gage-case off from the boiler and providing the air-space which intervenes between the back of the gage and the boiler with means of communication with the surrounding atmosphere constitutes the first part of my improvements.

The second part of my improvements consists in an arrangement for adjusting the leverage of the lever which communicates the motion of the ends of the steam-spring to the driving-rack of the index-hand. The gage which I have shown in this illustration and to which this improvement is particularly applicable is of the type commonly known as the "Lane" gage. Certain improvements upon it have been introduced of recent years, some of which are shown in the present application.

The Lane gage is a double spring-gage in which the two branches of the Bourdon tube are symmetrically disposed on either side of an imaginary vertical and lay hold directly or indirectly of a depending lever not fastened to the case of the gage, which lever communicates motion to a rack which engages with the index-pinion of the movement.

In the drawings, Fig. 4, E are the two branches of the Bourdon tube. Each of these branches is closed at its free end by a tip *e*, and the two branches of the tube are fastened to the hollow boss D, the interior of which communicates with the source of steam-supply. Upon the right-hand spring is pivoted at its free end the lever F, the upper end of which is shaped as shown in the drawings, Fig. 5. It has a pivot-hole f^2 in line with the pivot which connects the said lever with the tip *e* on the right-hand spring. This lever also has an ear *f* projecting diagonally upward and furnished with a hole which is threaded for the insertion of the clamping-screw. The lower end of the lever F is also provided with

a hole for the insertion of a screw which connects the lever F with the rack G.

O is an eccentric. It is slotted on one side, as shown in Fig. 7, for the insertion of the link N, and a transverse hole *p*, threaded for the insertion of a pivot-screw, is made to traverse the slot and serves as a pivot for the link N. This eccentric O is furnished with a projection away from its center, which is inserted into the hole f^2 of the lever F, and by turning the eccentric O around this projection the distance between the pivotal connection of the link N with the lever F and the pivotal connection of the same lever with the right-hand spring E can be regulated; but in order when this distance has been properly ascertained to fix it correctly, the eccentric O has projecting from it a slotted segment o^2, the slot in which coincides with the screw-hole in the ear *f* of the lever F. A slot is shown in the head of the eccentric for the insertion of a screw-driver to turn the eccentric on its pivot. A clamping-screw *q*, shown in the drawings, Figs. 4 and 7, serves to clamp together the eccentric O and lever F at any position of the pivot *p* which may be desirable.

A third part of my invention relates to means for keeping the teeth of the rack G in contact with the pinion *k*. As the lower end of the lever F runs to and fro in an arc which varies but little from a circular arc described around a center lying somewhat to the left of the body of the lever F between its two pivotal points of connection to or toward the spring ends, the angle of the rack G with the vertical of the gage-case will vary somewhat, and it has always been necessary to provide some means for keeping the teeth of the rack and of the pinion in engagement, and it has been found that the pressure of the point of a set-screw, or of the periphery of a wheel, or of a transverse rod is not a desirable way of keeping these teeth in engagement. The use of a hair-spring, as shown in Fig. 4 at S, will prevent backlash of the teeth, but will not prevent them from jumping up and down. I have found that by making a conical or conoidal recess in the bottom of the set-screw L and inserting in the hollow of this recess a small steel ball, or ball of other hard metal, better results are reached than by the other ways I have mentioned which were formerly employed. This ball gives a rolling friction substantially as well as a wheel, and, having no fixed axis of revolution, is not liable to some of the objections of a wheel. If the ball fitted the recess and bore upon it over half its circumference it probably would have too much friction to be of much service; but in the conical or conoidal recess it bears only at a portion of its circumference, and this portion of its circumference forms a circle less than a great circle, and thus apparently causes an imaginary axis of revolution to be established, not through the center of the ball, but at some point near, if not coincident with, a line parallel to the horizontal axis of the ball and near in position to the circle of contact between the internal cavity of the set-screw and the said ball.

In the drawings, Fig. 5, L is the set-screw, which is driven into a frame H, the flange of which is attached to the back of the gage. *l* indicates the recess in the point of the set-screw, and *m* the hard-metal ball resting on the rack G. K is the pinion of the indicating-hand.

The fourth improvement which I have devised relates to the steam-spring. This, as is well known, usually consists of a hollow flattened tube bent into an arc of a circle. The admission of pressure into this tube causes it to expand, and in expanding to straighten, and, as the tube is fast at its butt to the boss D, the straightening of the tube gives an upward and outward movement on an evolute curve to the free end of the spring to which the tips *e* are attached. The movement of the free end of a gage-tube is usually in actual practice very limited, and this movement is enhanced by leverages to form the indications of comparative pressure by the movement of a hand upon a dial. These springs are usually made of brass or composition, and as the metal of which these tubes are usually formed is a metal which hammer-hardens and receives a spring-temper from work bestowed upon it and which anneals under heat, much trouble arises from the weakening of springs or from the setting of springs when they are first put in use. These springs, as I have said, are of comparatively elliptical cross-section, and the curvature into which they are put in bending them for use in the gage is a curvature which disturbs the horizontal relation of planes through which the shorter axis of the ellipse runs.

The parts of the Bourdon tube which are in spring-tension are the longer sides of the ellipse, and the spring of the tube is due to the tension and compression of the metal which lies in these longer sides of the ellipse. In order to make the spring somewhat less susceptible to setting, I provide one or more longitudinal ribs on one or both of the longer sides of its elliptic cross-section. These ribs are shown in Figs. 8 and 9 at *r*. I do not, however, confine myself to two ribs, or insist that there should be more than one. I do not confine myself to ribs upon the inner side of the curvature of the spring or upon the convex side of the curvature of the spring; but I may bend the spring so that these ribs shall be on the convex or on the concave side of the finished spring, or on both sides of the finished spring.

Having thus described my invention, what I claim as my improvements, and desire to secure by Letters Patent, is—

1. The combination of the lever F, provided with the pivot-hole f^2 and ear *f*, with the link N and eccentric O, provided with the slotted segment-flange o^2 and clamping-screw *q*, substantially as and for the purpose described.

2. The combination of the pinion K, rack G, hard-metal ball *m*, and set-screw L, provided with the conoidal recess *l*, the line of contact between the periphery of said ball *m* and the interior of said conoidal recess *l* being above the center of said ball, and the surface of said internal recess *l* which comes in contact with said ball *m* being a surface of less diameter than a great circle of said ball *m*, substantially as and for the purpose described.

3. In combination with the steam-spring of a Bourdon gage of elliptical cross-section, the ribs *r*, formed upon one or both of the long sides of said spring and running longitudinally of said spring, substantially as and for the purpose described.

CHARLES A. G. WINTHER.

Witnesses:
J. M. DOLAN,
M. MCFAGUE.