

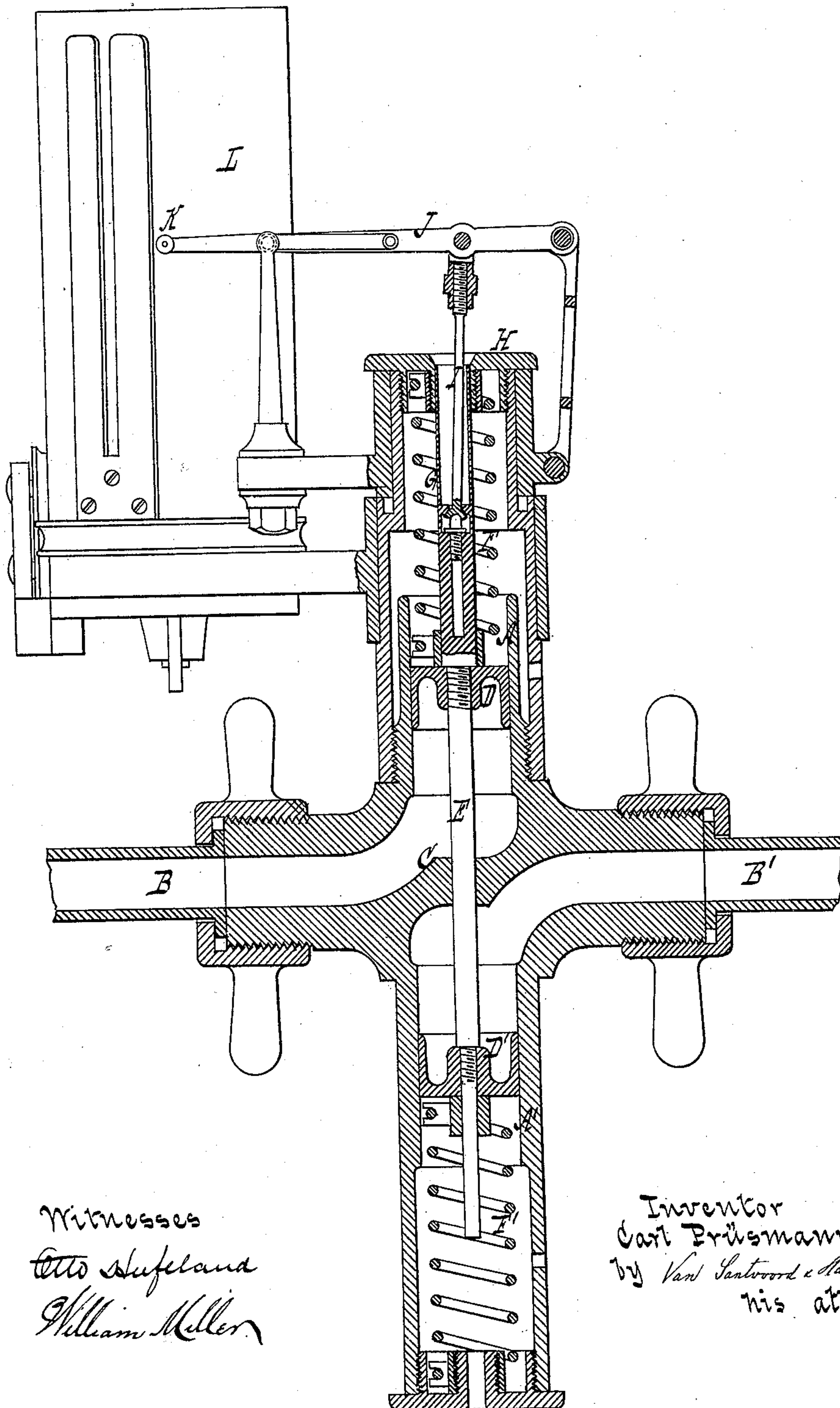
(No Model.)

C. PRÜSMANN.

DIFFERENTIAL STEAM PRESSURE RECORDER.

No. 250,839.

Patented Dec. 13, 1881.



Witnesses
Otto Stufeland
William Miller

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UNITED STATES PATENT OFFICE.

CARL PRÜSMANN, OF BUCKAU, NEAR MAGDEBURG, PRUSSIA, GERMANY,
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DIFFERENTIAL STEAM-PRESSURE RECORDER.

SPECIFICATION forming part of Letters Patent No. 250,839, dated December 13, 1881.

Application filed May 25, 1881. (No model.)

To all whom it may concern:

Be it known that I, CARL PRÜSMANN, a subject of the King of Prussia, residing at Buckau, near Magdeburg, in the Kingdom of Prussia and German Empire, have invented new and useful Improvements in Steam-Engine Indicators, of which the following is a specification.

This invention consists in the combination of two cylinders, one of which communicates with one and the other with the opposite end of the working-cylinder, two pistons, one for each of the indicator-cylinders, a rod connecting the two pistons, two springs, one acting on the back of each piston, and suitable mechanism for transmitting the motion of the pistons to the tracer, so that for each stroke of the steam-piston the difference between the pressure on its opposite sides is recorded by the tracer.

This invention is illustrated in the accompanying drawing, which represents a vertical central section.

The diagrams for determining the effect of steam-engines, which are obtained by the indicators at present in use, as is well known, do not give a direct illustration of the total pressure resulting from the pressure in front and behind the steam-piston and acting upon the piston-rod, but simply an illustration of the pressure existing in one and the same end of the working-cylinder during one revolution of the engine. The upper portion—that is to say, the steam and expansion line of such a diagram—does not really belong to the retrograde line marked beneath it, but to a retrograde line which would be formed, if at the same time an indication of the other end of the steam-cylinder would be taken. If, notwithstanding this fact, in the present practice in such a diagram the retrograde line of the same cylinder end were represented in a reverse position, it is assumed that the engine works with a uniform pressure on both cylinder ends during two successive revolutions; and if, as is frequently done, the indicator is brought successively in communication with both cylinder ends by means of a three-way cock, it is assumed that the pressure in the steam-cylinder remains uniform during several successive revolutions. All these assumptions can lead, according to circumstances, to mistakes which can only be avoided by the use of two indicators, one on each end

of the steam-cylinder, and by great care, if at the same time the tracers of both indicators are forced in, so that simultaneously with the upper diagram curve of one indicator the appropriate counter-pressure or retrograde curve of the other indicator is obtained. These lines must then be brought together by hand in one diagram, in order to obtain by subtraction from the corresponding ordinates the distances which represent the effective pressure acting on the piston-rod at any given moment. From these observations the leading idea embodied in my indicator will be readily understood.

In the accompanying drawing, the letters A A' represent two cylinder, which are, by preference, formed in one and the same casting, and one of which communicates by a channel and pipe, B, with one end of the steam-cylinder, while the other communicates by a channel or pipe, B', with the other end of the working cylinder, communication between the inner ends of the cylinders A A' being cut off by a fixed partition, C. Said cylinders are open at both ends, and they are provided each with a piston, D or D', that are connected by a rod, E, extending through the partition C. The pistons D D' are exposed to the action of springs F F', which are so balanced that they have a tendency to retain said pistons in a certain position, which may be termed "the position of rest." From the piston D extends a tubular rod, G, which slides in the head H, and from the interior of which extends a connecting-rod, I, to a lever, J, which carries the tracer K. Any other suitable connection between the pistons D D' and the tracer K may, however be substituted for that shown in the drawing.

L is the drum which supports the paper.

As long as the engine is at rest the pistons D D' retain their position of rest; but if the engine is started, the upper spring, F, is exposed to a pressure equal to the difference between the pressures in front and in the rear of the working-piston as the same travels in one direction, and on the back-stroke of the working-piston the lower spring, F', is exposed to a pressure equal to the difference between the pressures in front and in the rear of the working-piston during its back-stroke. The diagram obtained, therefore, is a line which is situated partly above and partly beneath the

atmospheric line, and the deviation from the atmospheric line on either side gives correctly the effective pressure upon the piston-rod. The curve above the atmospheric line indicates the work of one, and the curve below the atmospheric line the work of the other, end of the working-cylinder, and the entire closed curve gives the work during one revolution.

If one of the pipes B or B' is closed, the diagram of one cylinder end is obtained in the manner now practiced. If the separate diagrams of both cylinder ends and also the combined diagram are marked on the same strip of paper, a clear illustration is obtained which greatly facilitates the calculation.

My double indicator has also the following advantages: It is entirely unaffected by the variations of the atmospheric pressure or of the barometer. While in all other indicators the indicator-piston is exposed at one side to the atmospheric pressure, the effect of the atmospheric pressure upon the pistons of my double indicator is balanced.

If it is considered that the indicator-springs can only be adjusted correctly for a certain fixed atmospheric pressure, and that the at-

mospheric pressure varies constantly, and particularly that the variations in the atmospheric pressure are very great if the indicator is used on a locomotive traveling over mountains, or on an engine situated in a mine, it will be readily understood that my double indicator gives diagrams which are much more correct than those of the single indicator.

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

The combination, substantially as hereinbefore described, of the two indicator-cylinders, one of which communicates with one, and the other with the opposite, end of the working-cylinder, the two pistons, one for each indicator-cylinder, the rod connecting the two pistons, the two springs, one for each piston, and suitable mechanism for transmitting the motion of the pistons to the tracer.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

CARL PRÜSMANN. [L. S.]

Witnesses:

WILLIAMS C. FOX,
JOSS. KRACKE.