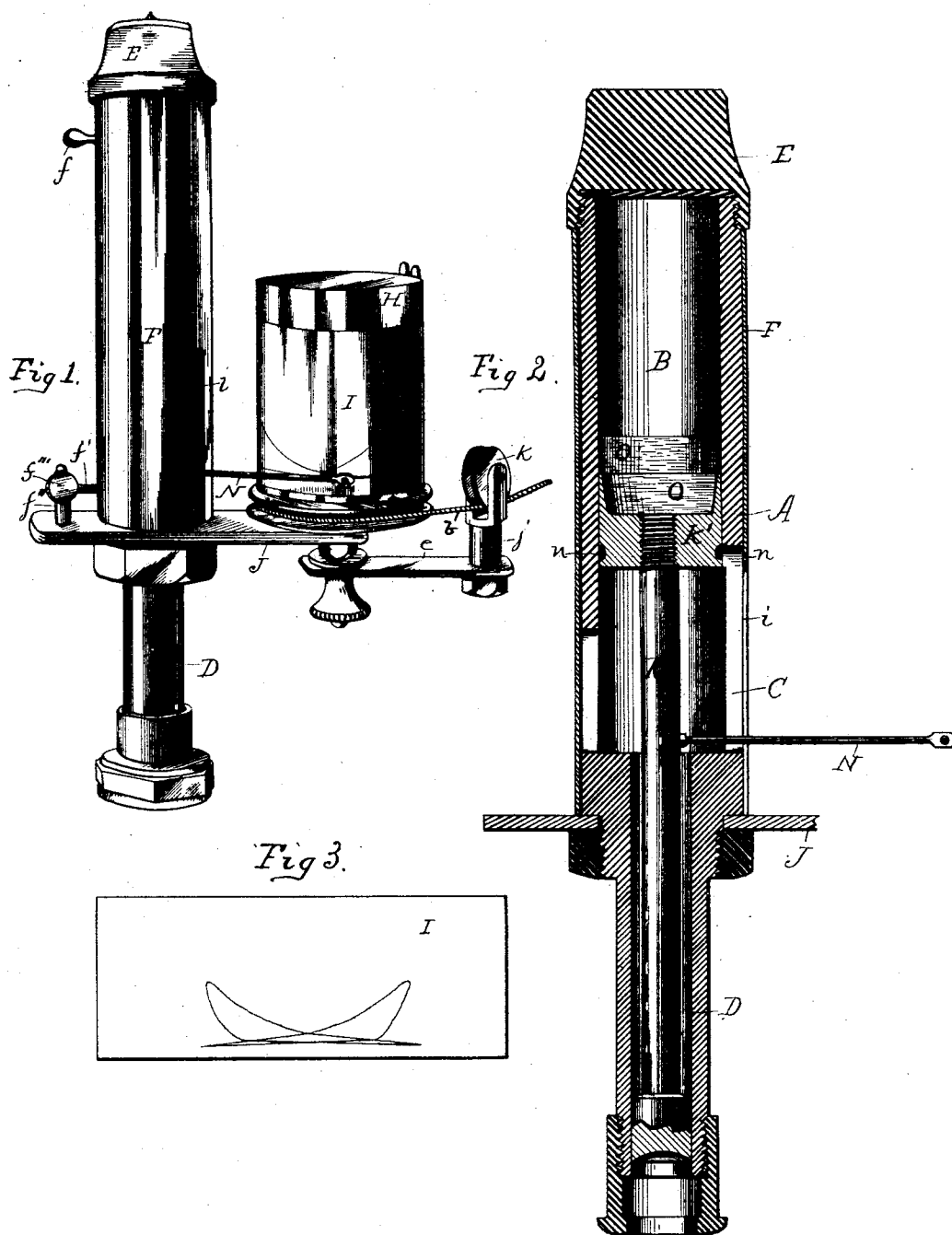


(No Model.)

W. M. DODD.
STEAM ENGINE INDICATOR.

No. 511,760.

Patented Jan. 2, 1894.



WITNESSES:

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UNITED STATES PATENT OFFICE.

WILLIAM M. DODD, OF DAYTON, OHIO.

STEAM-ENGINE INDICATOR.

SPECIFICATION forming part of Letters Patent No. 511,760, dated January 2, 1894.

Application filed June 22, 1893. Serial No. 478,423. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. DODD, of Dayton, county of Montgomery, State of Ohio, have invented a new and useful Improvement in Steam-Engine Indicators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in steam engine indicators of the kind employed to register the pressure of the steam in the cylinder of a steam engine during the working of said engine, having a rotating drum in connection therewith, surrounded by a card upon which is indicated, in pencil lines, the variations of the pressure.

The improvements have a special reference to the pressure exerted on the top of the indicator piston which consists in means to compress the air in the air chambers, whereby the lines of expansion will approximate a theoretical line whether the engine is being run at a high or low rate of speed.

In the drawings herewith annexed and forming a supplement to the specification: Figure 1. is a view of the steam indicator containing my improvements. Fig. 2. is a vertical longitudinal section of the cylinder. Fig. 3. is a diagram of a card taken on my indicator from an engine making two hundred and forty revolutions per minute.

A indicates the indicator cylinder, in the upper portion B, of which an air cushion is formed by means of which a uniform and steady pressure is brought to bear on the head of the piston rod, to be hereinafter more fully described; this chamber B, of which the piston head forms the lower inclosure, is air-tight so that as the piston is forced upward, by the steam, the air in said chamber has no avenue of escape. The portion of the cylinder immediately below the air-tight chamber, indicated by C, is necessarily open to admit of the pencil arm traveling vertically with the piston; the piston head, however, does not descend to this portion of the cylinder.

D is the lower portion of the cylinder forming the steam chamber, and in which the

lower portion of the piston rod moves by the action of the steam. This end of the cylinder is attachable to the cylinder of the engine which it has not been deemed necessary to show in the drawings. The upper extremity of the cylinder is tapped to receive the cap E which completes the air chamber B and excludes the entry or outlet of air at that point.

F indicates the outer tube or casing to which the knob *f* is fixed, and the arm *f'* is similarly attached, through which a thumb screw *f'''* is placed that works against the upright post *f''* the purpose of which is to shift the pencil arm, to be hereinafter described.

H indicates the rotating drum upon which the card I is placed to receive the lines indicating the varying pressure of the steam.

J indicates the base plate or support for the cylinder, the drum and adjacent devices.

e indicates an arm extending laterally from the stem of the drum, and upon which it is maintained by a thumb-screw; to this arm is attached vertically, a bifurcated post *j* upon which a guide pulley *k* is pivoted over which a cord *b* is drawn. One end of said cord is attached to the cross head of the engine while the other end is secured to the drum, and the effect is to rotate the drum against tension applied thereto by means of an internal spring, all of which are well known means and do not constitute parts of my invention.

K indicates a piston rod, and K' the head thereof, which is cupped out and provided with a circumferential groove *n*; the diameter of the piston head is such that it enables a movement of the same within the cylinder to take place without friction; a piston having this feature, ordinarily, is not capable of excluding the admission of air to the chamber or preventing its escapement therefrom. In order that the air therein may be subjected to compression by said piston, I prevent the atmosphere from entering the air chamber or the air from escaping therefrom by placing a quantity of cylinder oil O or other oil having the desired density, upon the top of the piston, to entirely cover the piston head, substantially as shown in Fig. 2, so as to secure a perfectly air tight joint; the effect of the oil so placed is to act as a packing to prevent the air from entering or escaping from

the air chamber B, which it does by closing up the space between the sides of the piston head and the cylinder and entering the channel *n*, around the circumference of said head.

5 As the piston is moved upwardly by the increased pressure of steam entering from the engine cylinder, the air in the chamber B, is compressed, forming an air cushion therein. The pressure exerted by the compressed air

10 maintains a graduated pressure against the piston whether the steam is being increased or decreased, by acting to counterbalance the pressure thereof, that is to say, if there be sixty pounds or any given quantity of steam

15 pressure, the air pressure in chamber B will be the same; the result is that a gradual or systematic movement of the piston is effected to indicate the lines of expansion, which are not subjected to sudden or irregular vibra-

20 tions, as in the case where spring pressure or other similar pressure is exerted against the piston head.

N denotes the pencil arm attached to the piston rod by screw threads or otherwise; this

25 arm is adapted to be carried up or down by providing a vertical slot *i* in the cylinder and outer casing, and by means of a pencil attached to the ends thereof, the parallel lines are recorded.

30 The parts of my invention may vary as to proportions without departing from the same, but it is important that the diameter of the piston head be constructed of a size to avoid friction and at the same time avoid too great

35 a space between these parts.

I am aware that it is not new to construct

a piston head with a circumferential groove or grooves to receive packing, and I am further aware that it is old to employ oil or liquid packing in air and gas pumps, and to seal the valves and joints in various machinery, notably ice-making machinery. I am not aware, however, that it is old to use liquid packing as described, in the cylinder of a steam indicator to effect a reactionary movement of the piston by forming an air cushion in the upper end of the cylinder.

Having described my invention, I claim—

1. In a steam pressure indicator, the combination of a cylinder having the air chamber B; the piston rod, the head of which is adapted to move in said chamber; the pencil arm attached to said piston; the rotating drum; and means for preventing the entry of air to, or the escapement of air from the chamber B, whereby an air cushion is formed to exert pressure against the piston head, as herein described.

2. The combination with the piston; of a cylinder having an air chamber in the upper portion thereof; and means for forming an air cushion therein to counter-balance the pressure exerted by the steam on said piston, whereby the pressure of said steam will be recorded in graduated and uniform lines, as herein described.

In testimony whereof I have hereunto set my hand this 13th day of June, 1893.

WILLIAM M. DODD.

Witnesses:

A. P. DILL,

R. JAY MCCARTY.