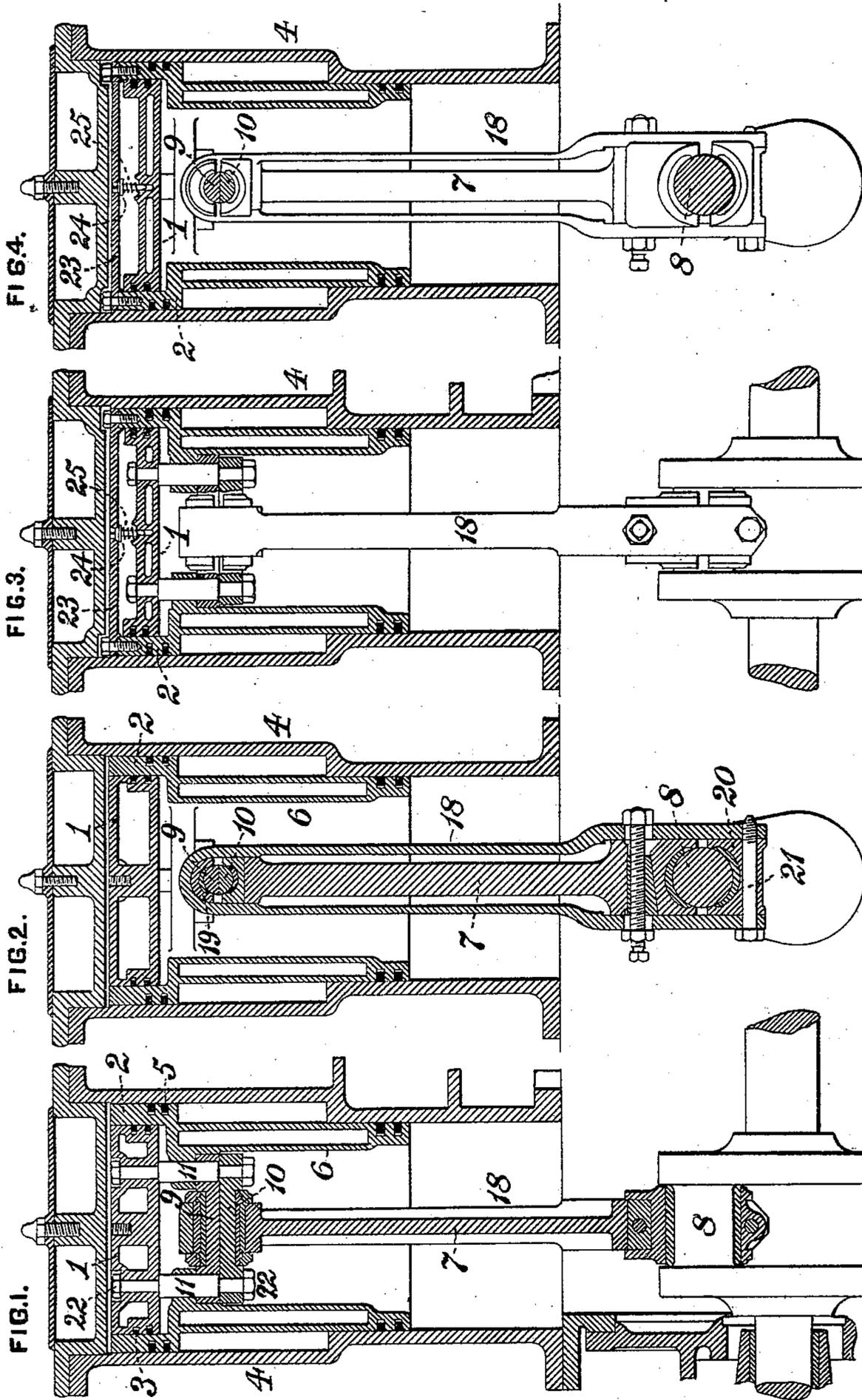


G. WESTINGHOUSE, Jr. PISTON.

No. 455,029.

Patented June 30, 1891.



WITNESSES

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FIG.5.

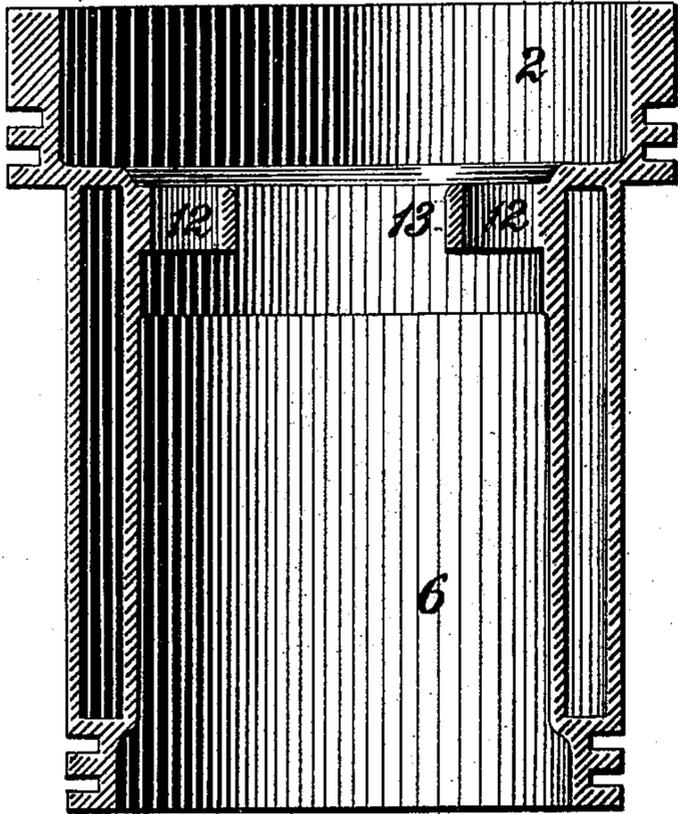


FIG.7.



FIG.8.

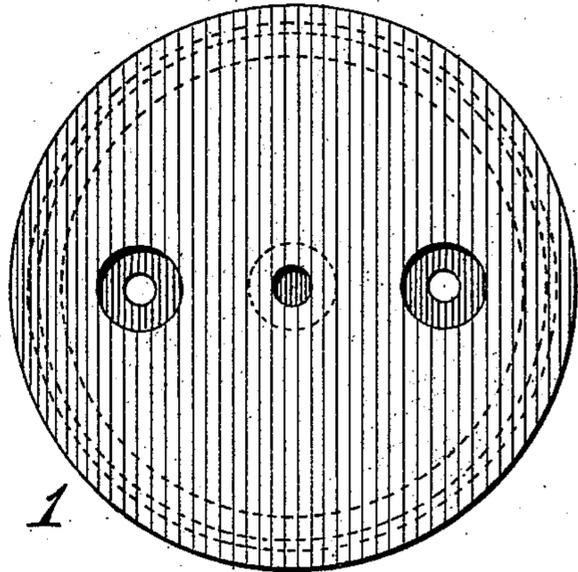


FIG.6.

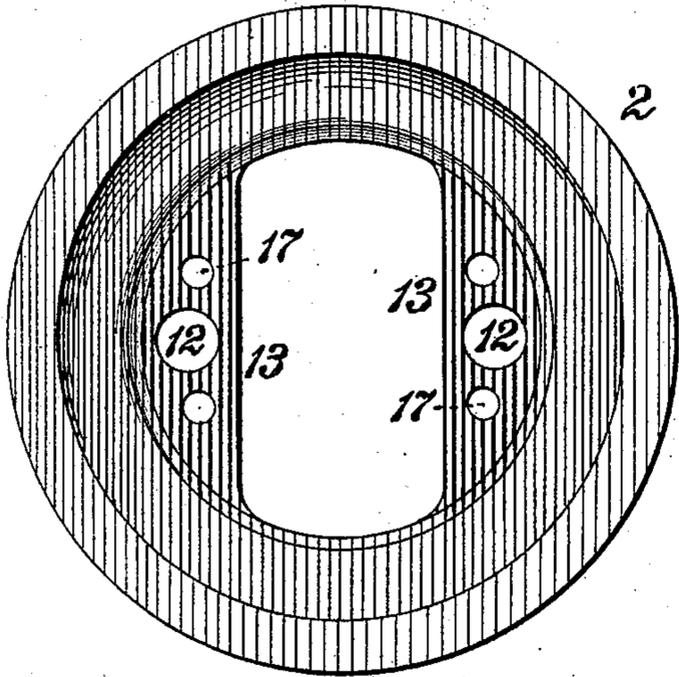


FIG.9.

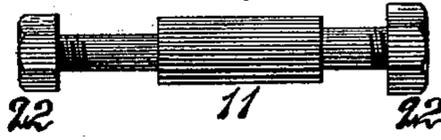


FIG.10.

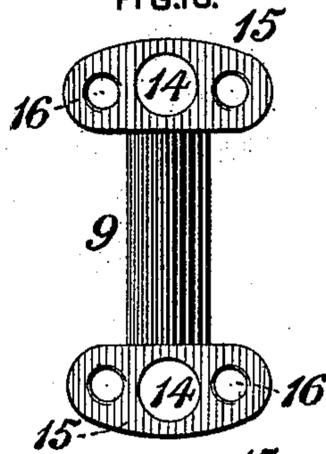


FIG.12.

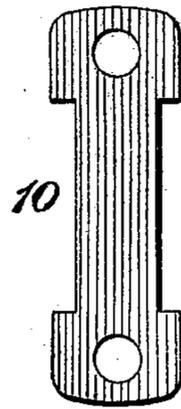


FIG.11.



FIG.13.



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UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

PISTON.

SPECIFICATION forming part of Letters Patent No. 455,029, dated June 30, 1891.

Application filed February 16, 1889. Renewed May 13, 1891. Serial No. 392,607. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Pistons, of which improvement the following is a specification.

My invention relates to pistons for engines, pumps, or blowers of the class usually of trunk form, in which a piston-rod is dispensed with and the connecting-rod is coupled directly to a pin fixed upon the piston, and its object is to provide a piston of such type by the employment of which wear or lost motion in the connecting-rod bearings may be automatically taken up or compensated for.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a longitudinal central section through the cylinder and piston of a compound engine, illustrating an application of my invention; Fig. 2, a similar section taken at a right angle to Fig. 1; Figs. 3 and 4, similar sections, respectively, illustrating a modification; Fig. 5, a longitudinal central section, on an enlarged scale, through the outer and lower section of the head of the piston of Figs. 1 and 2; Fig. 6, a plan or top view of the same; Fig. 7, a longitudinal central section through the inner and upper section of the same piston; Fig. 8, a plan or top view thereof; Fig. 9, a view in elevation of one of the wrist-pin bolts detached; Fig. 10, a plan view, and Fig. 11 a transverse section, of the upper section of the wrist-pin; and Fig. 12, a plan view, and Fig. 13 a transverse section, of the lower section of the wrist-pin.

My invention is herein illustrated as applied in the trunk-piston of a compound engine, in which the upward stroke is effected by the exertion, initially, of the steam-pressure upon the annular face of the piston-head between its trunk and the wall of the cylinder in which it works, and the downward stroke is effected under compound expansion by the pressure of steam exhausted from below the piston upon the entire area of its upper face, an engine of such character being set forth in a separate application, Serial No. 300,166, filed of even date herewith by me and by

Francis M. Rites jointly, and not being claimed as of my present invention.

Referring first to Figs. 1 and 2 and the detailed views, Figs. 5 to 13, inclusive, relating thereto, I provide in the practice of my invention a piston-head which is divided transversely to its axial line into two sections 1 and 2, the upper section 1 being fitted within the lower section 2, and being provided with proper packing-rings 3 to maintain a steam-tight joint between the two. The lower section 2 is fitted to work freely within the bore of the cylinder 4, with which it is made tight in the usual manner by packing-rings 5. An annular open-ended extension or trunk 6 is formed upon the lower section of the head, within which the connecting-rod by which the piston is coupled directly to the crank-pin 8 operates. The articulated attachment of the connecting-rod to the piston is effected through the intermediation of a sectional or divided wrist-pin, the preferred form of which is, as shown, composed of two independent sections 9 and 10, each of which is semi-cylindrical in form for such portion of its length as forms a bearing for the connecting-rod, and the flat sides of which are adapted to abut in the longitudinal central plane of the wrist-pin parallel with the upper and lower faces of the piston-head. The lower section 10 of the wrist-pin is secured to the upper section 1 of the piston-head by bolts 11, having their end portions, which pass through the piston-head 1 and wrist-pin section 10, reduced in diameter to form shoulders, against which the connected elements 1 and 10 are firmly clamped by nuts 22, engaging screw-threads cut on the end portions of the bolts. The bolts 11 fit in and pass freely through openings 12 in lugs or guide-flanges 13, formed on the inside of the trunk 6 of the lower piston-head section and through corresponding openings 14 in end blocks 15, formed upon the upper section 9 of the wrist-pin, which section is secured to the lower section 2 of the piston-head by bolts, which are not shown, but which pass through openings 17 in the flanges 13 of the trunk, and are tapped into openings 16 in the end blocks 15 of the wrist-pin section 9. It will thus be seen that the two sections of the wrist-pin have the capacity of independent movement

toward and from the plane of their abutting faces, in accordance with the relative movements of the piston-head sections, to which they are, as above described, respectively connected, and, further, that downward pressure upon the upper piston-head section 10 will exert corresponding downward pressure upon the lower wrist-pin section 10, while upward pressure upon the piston will correspondingly exert upward pressure upon the upper wrist-pin section 9, the tendency of pressure in either direction being to spread apart or separate the adjacent faces of the wrist-pin sections. As a result of this construction, while compressive strain will, as in the ordinary manner, be exerted upon a connecting-rod which is coupled to the sectional wrist-pin, in the downward stroke of the piston and tensile strain in the upward stroke, the induced tendency to separation of the wrist-pin sections will, in the movements of the piston, automatically take up any wear or lost motion between the wrist-pin and the bearings of the connecting-rod thereon.

In lieu of a single wrist-pin divided into two sections, as above described, it will be obvious that, if preferred, there may be employed as an equivalent construction within the scope of my invention two independent wrist-pins, located one above the other, each of said wrist-pins being connected to one section of the piston-head, and the two being subject to constant tendency to separation parallel to their axes, as in the construction described and shown.

With a connecting-rod of the usual form the automatic adjustment will be effected only at the piston end, manual adjustment at the crank-pin end, which is readily accessible, being necessary, as heretofore. In order to extend such adjustment to the crank-pin end of the connecting-rod, the latter is formed with a main body 7 and an encircling-strap 18, which incloses and fits freely around the upper wrist-pin bearing 19 and extends continuously along each side of the body of the rod to its lower crank-pin bearing 20, to which it is secured by a bolt 21, both of said bearings being separate from and uninclosed by the body of the rod. By such construction compressive strain will in each direction of movement of the piston be exerted upon the body of the rod from the lower wrist-pin section 10, and tensile strain upon the strap 18 from the upper wrist-pin section 9, the exertion of such opposing strains upon the crank-pin serving to automatically take up or compensate lost motion and wear between the same and its bearings by forcing the latter closely against its periphery through the tendency to longitudinal separation of the body and strap of the rod induced by the sectional piston-head and wrist-pin.

The modification shown in Figs. 3 and 4 is designed for use in engines in which the ex-

haust from the cylinder-space above the piston is effected into a condenser, and a partial vacuum thereby maintained above the upper piston-head section in the upward stroke, in order to maintain a sufficient degree of pressure upon said section to effect compressive strain upon the rod through the lower wrist-pin section. To this end the upper piston-head section 1 is wholly inclosed in a space within the lower section 2, which is closed at top by a tight cap 23, secured to the upper face of the section 2, an opening being formed in said cap, which is governed by an inwardly-opening valve 24, pressed up to its seat by a spring 25. In the downward movement of the piston steam enters and fills the space within the section 2 above the section 1 by the valve 24, which on the upward stroke is closed by the spring 25, the steam entrapped within the space above the section 1 exerting downward pressure upon said section and upon the connected wrist-pin section 10 and connecting-rod body 7 during the upward stroke. If greater pressure is desired, the supply of steam to the space within the section 2 may be effected by a pipe of small diameter leading thereto from the lower annular face of the piston, which, as before stated, is subject to high-pressure steam.

I am aware that a compound piston formed in two parts which are independently connected by separate piston-rod sections to the two parts of a split or divided wrist-pin has been heretofore proposed and illustrated, and such construction, therefore, I do not claim.

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

1. The combination, in a piston, of a head divided transversely to its axial line into two independent sections, one of said sections fitting freely in a space within the other, a longitudinally-divided wrist-pin, each section of which is secured to one of the sections of the head, a tight cap or cover closing the space within the outer piston-head section, and an inwardly-opening valve controlling an opening in said cap, substantially as set forth.

2. The combination, in a piston, of a head divided transversely to its axial line into two independent sections, a wrist-pin divided longitudinally into two sections, bolts secured at opposite ends to one of the piston-head sections and to one of the wrist-pin sections, and bolts securing the other wrist-pin section to the other piston-head section on opposite sides of the bolts first specified, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:

J. SNOWDEN BELL,
R. H. WHITTLESEY.