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J. METZGER.

TANDEM COMPOUND ENGINE BUSHING.

APPLICATION FILED AUG. 8, 1904.

NO MODEL.

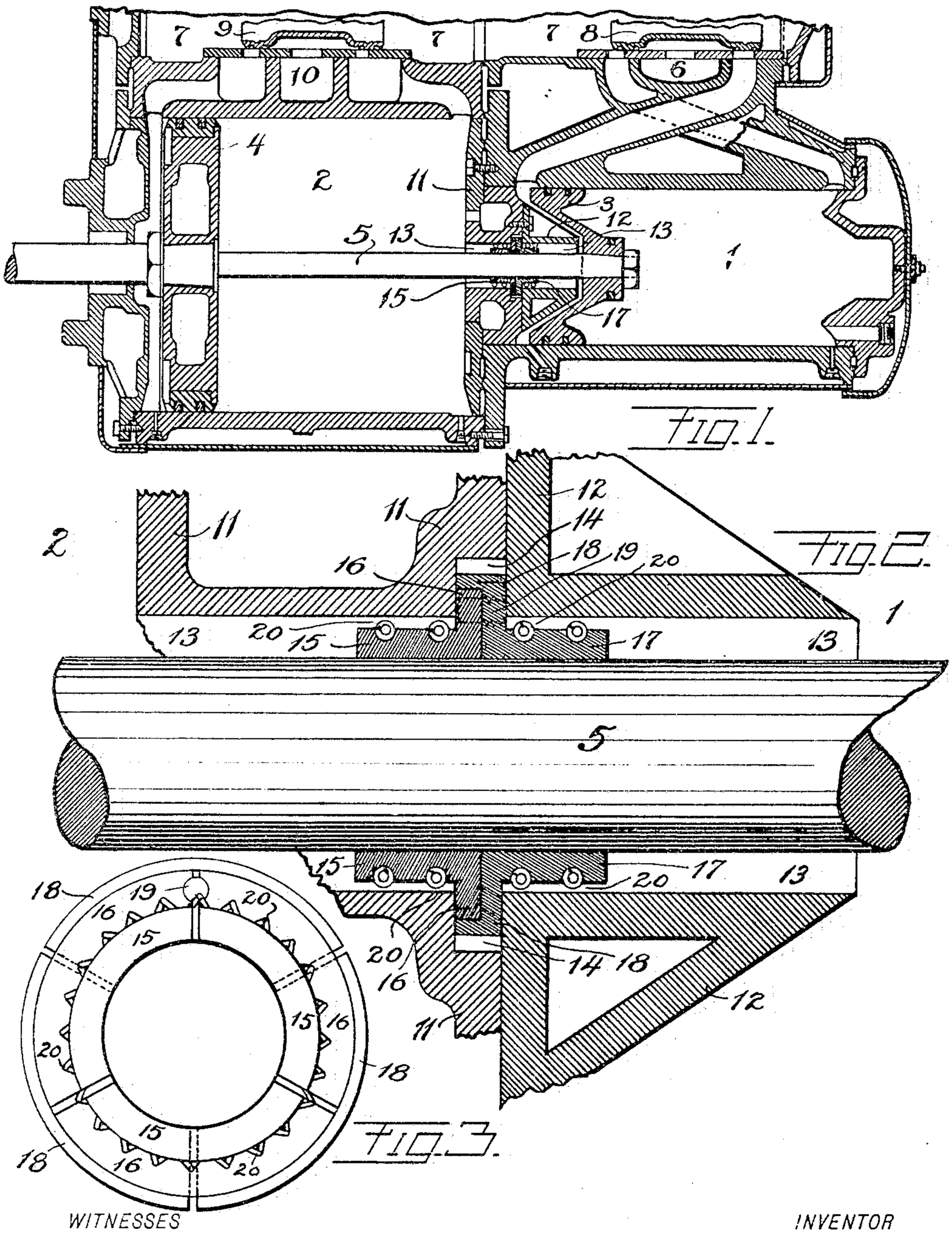

FIG. 1.

FIG. 2.

FIG. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

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TANDEM-COMPOUND-ENGINE BUSHING.

SPECIFICATION forming part of Letters Patent No. 775,376, dated November 22, 1904.

Application filed August 8, 1904. Serial No. 219,944. (No model.)

To all whom it may concern:

Be it known that I, JOHN METZGER, a citizen of the United States of America, residing at Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Tandem-Compound-Engine Bushings, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to the bushing placed around the piston-rod between the high and low pressure cylinders in a tandem compound steam-engine, and has for its objects to increase the efficiency of the bushing by decreasing the leak of steam from the high to the low pressure cylinder and to increase the life of the bushing by making it self-adjusting and to decrease the wear of the piston-rod at the end near the high-pressure piston by decreasing the leak of steam as above stated.

I attain these objects by the devices illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the high and low pressure cylinders of a tandem compound engine equipped with my improved bushing. Fig. 2 is an enlarged vertical longitudinal section of the bushing, and Fig. 3 is an end view thereof looking from the low-pressure cylinder toward the high-pressure cylinder.

Similar numerals of reference refer to similar parts throughout the several views.

One of the principal obstacles to the successful working of tandem compound steam-engines, especially locomotives, is found in the difficulty in keeping the high-pressure steam from leaking through the bushing to the low-pressure cylinder when the pistons are on the inward stroke, as shown in Fig. 1, because the full boiler-pressure is applied to one side of the bushing, while the other side is connected to the condenser or to the atmosphere through the exhaust. This unequal pressure is greatest when at the beginning of the inward stroke. The usual construction has been to make a long solid bushing extending from end to end of the passage through which the piston-rod passes. As soon as this bushing wore a little the steam would rush through to the exhaust and would very materially wear the piston-rod near the high-pressure piston and would thus reduce the efficiency of the engine every inward stroke.

In the drawings I have indicated the high-pressure cylinder at 1, the low-pressure cylinder at 2, the high-pressure piston at 3, the low-pressure piston at 4, the piston-rod at 5, the steam-inlet passage at 6, the valve-chest and intermediate chamber at 7, the high-pressure valve at 8, the low-pressure valve at 9, the exhaust-passage at 10, the wall between the high and low pressure cylinders at 11, the cone in the high-pressure cylinder at 12, the passage through the wall 11 and the cone 12 at 13, and the recess in the wall 11 from the passage 13 at 14.

In none of the above parts have I changed the usual method of constructing the engine.

Referring principally to Figs. 2 and 3, it will be seen that my bushing is constructed in two parts, each part divided into three pieces. The part 15 of my bushing is nearest the low-pressure cylinder 2, and consists of a short cylindrical sleeve with a short flange 16 engaging in the recess 14 in the wall 11. This part 15 does not fit tightly in the passage 13, but fits the piston-rod 5 except at the three points where it is cut, Fig. 3. The flange 16 fits tightly against the side of the recess 14 except where it is cut. The flange 16 is practically half as thick as the recess 14.

The part 17 of the bushing is nearest the high-pressure cylinder 1 and consists of a short cylindrical sleeve practically of the same dimensions as the sleeve of the part 15 and has a flange 18, which is adapted to fit exactly into the recess 14 between the wall 11 and the cone 12, but which is recessed to accurate fit over the flanges 16 of the part 15. The part 17 is also cut into three pieces, and when the parts 15 and 17 are assembled they are arranged as shown in Fig. 3, so that the open spaces between the pieces of the part 15 do not come near the similar open spaces between the pieces of the part 17, and they are retained in their proper relative positions by the dowel-pin 19. Circular spiral springs 20 hold the pieces of the parts 15 and 17 together. I pre-

fer to use two such springs placed in grooves on the outside of the sleeves of each of the parts 15 and 17.

It is evident that as the piston-rod 5 or the bushings 15 and 17 wear the bushing will close around the piston-rod and will always keep a steam-tight joint along the rod between the two cylinders 1 and 2, and the flanges will always form a steam-tight joint around the bushings. Further, the flange 18 of the part 17 nearest the high-pressure cylinder incloses the flange 16 of the part 15. As the pressure of the steam around the part 17 is greater than the pressure around the part 15, the wear of the part 17 will tend to be greater than that of the part 15; but as the flange 18 surrounds the flange 16 it immediately increases the pressure on the part 15, and thus distributes the pressure all along the bushing. This arrangement tends to stop the wear of the piston-rod 5 at the point where at present it always shows the greatest wear—namely, near the high-pressure piston. The flanges 16 and 18 prevent the passage of steam around the outside of the bushing.

In practice I find that tandem compound locomotives fitted with my bushing have run for many months with no measurable wear to the piston-rod and but very little to the bushing, whereas the same locomotives needed a renewal of bushings every four weeks and the piston-rods needed returning every six months. The advantage, therefore, of my bushing is apparent.

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

In a tandem-compound-engine bushing, the combination with the wall between the high and low pressure cylinders having a piston-rod passage therein and with a recess in the end of said passage nearest the high-pressure cylinder, a casting within said high-pressure cylinder and constructed so as to continue the piston-rod passage and so as to form one side of said recess, a split bushing within said passage in said wall and having a circular flange engaging in said recess, a split bushing within said passage in said casting and having a flange of greater diameter than the flange on the first bushing and further having a recess in said flange adapted to fit over said flange on said first bushing and means for retaining said bushings from turning relatively to each other.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN METZGER.

Witnesses:
M. H. Cony,
W. E. Windsor.