No. 738,129. PATENTED SEPT. 1, 1903.

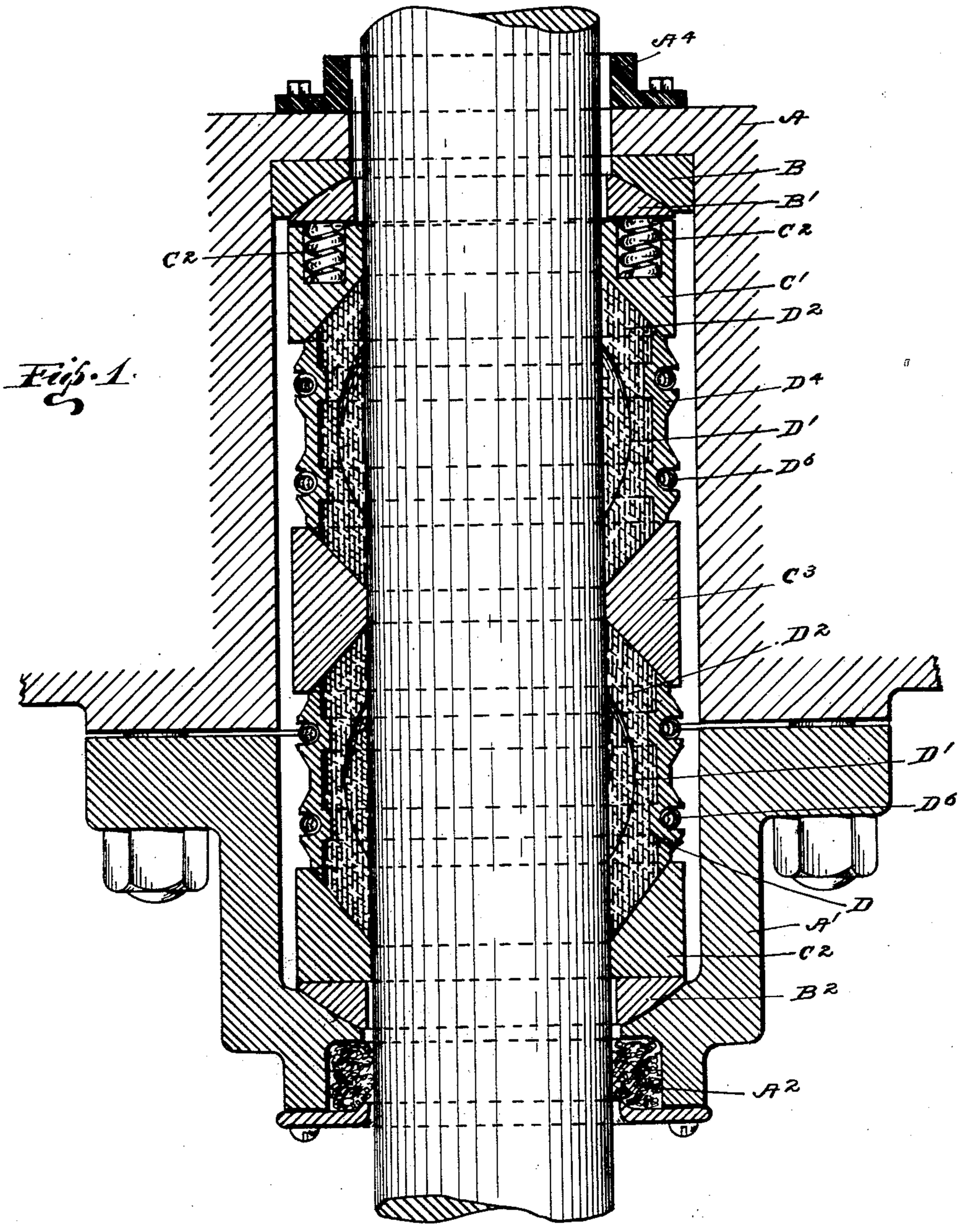
E. W. TUCKER.

METALLIC PACKING.

APPLICATION FILED MAR. 21, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

E. W. Tucker Jr.

M. J. Kuhl.

INVENTOR.

Edwin W. Tucker.

BY Munson Dale & Co

ATTORNEYS.

No. 738,129. PATENTED SEPT. 1, 1903.

E. W. TUCKER.

METALLIC PACKING.

APPLICATION FILED MAR. 21, 1902.

NO MODEL. 5 SHEETS—SHEET 2.

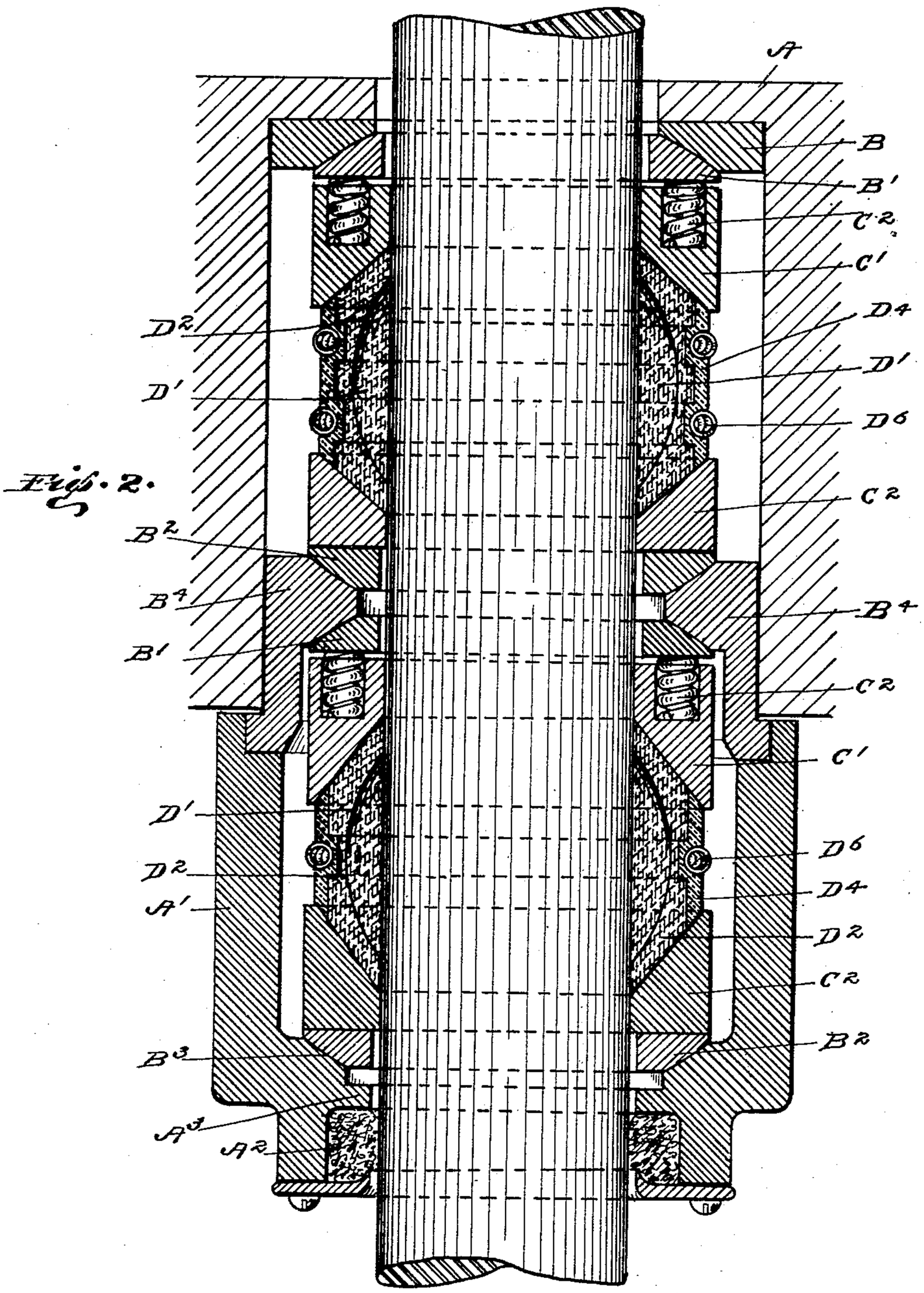


Fig. 2.

WITNESSES:

E. W. Tucker Jr.

M. J. Kuhl.

INVENTOR.

Edwin W. Tucker.

BY Murdock, Vale & Co.

ATTORNEYS.

No. 738,129. PATENTED SEPT. 1, 1903.

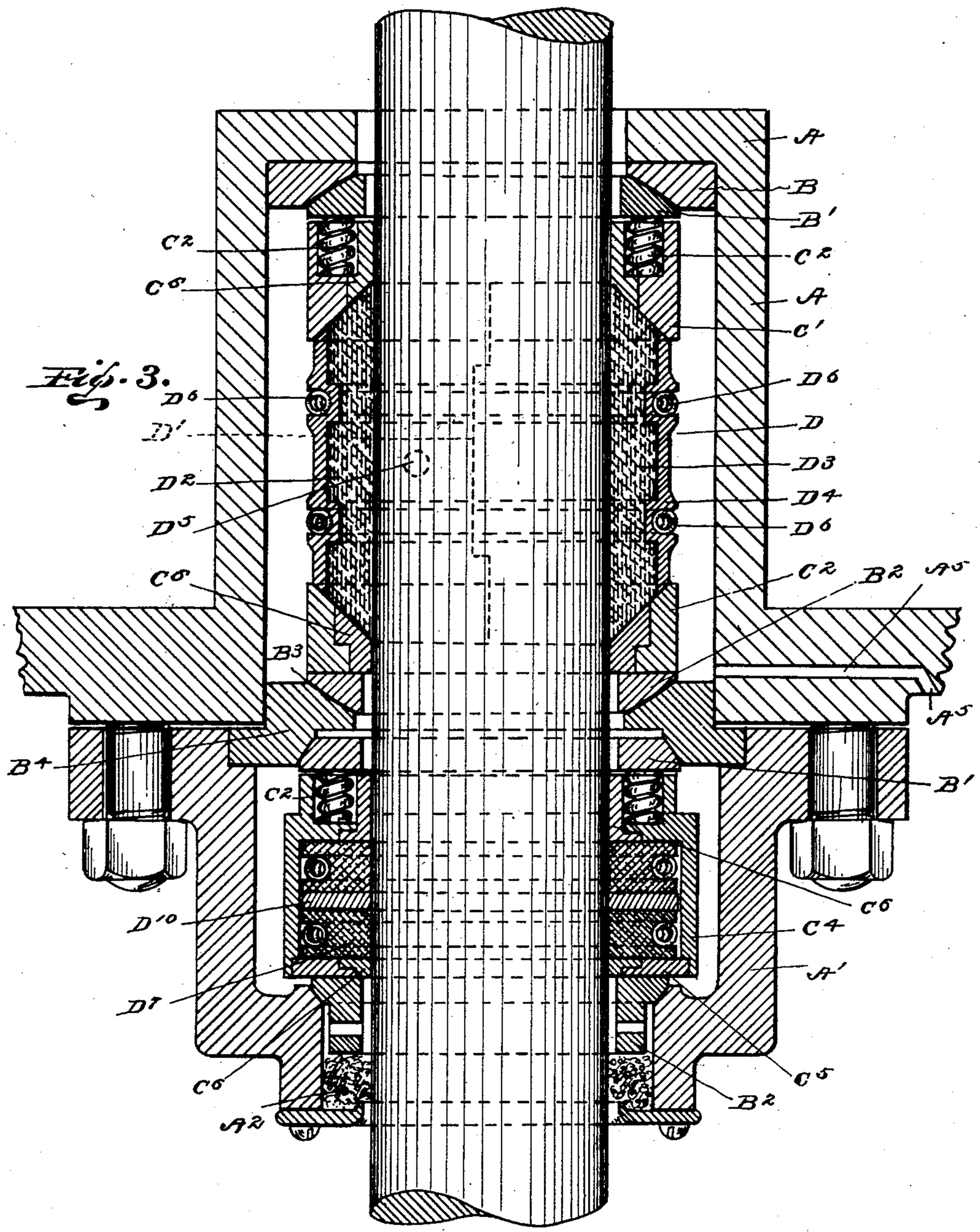
E. W. TUCKER.

METALLIC PACKING.

APPLICATION FILED MAR. 21, 1902.

NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3.



WITNESSES:
E. H. Tucker Jr.
M. J. Kuhl.

INVENTOR.
Edwin W. Tucker.
BY Murdock Tate & Co
ATTORNEYS.

No. 738,129. PATENTED SEPT. 1, 1903.

E. W. TUCKER.

METALLIC PACKING.

APPLICATION FILED MAR. 21, 1902.

NO MODEL. 5 SHEETS—SHEET 4.

Fig. 5.

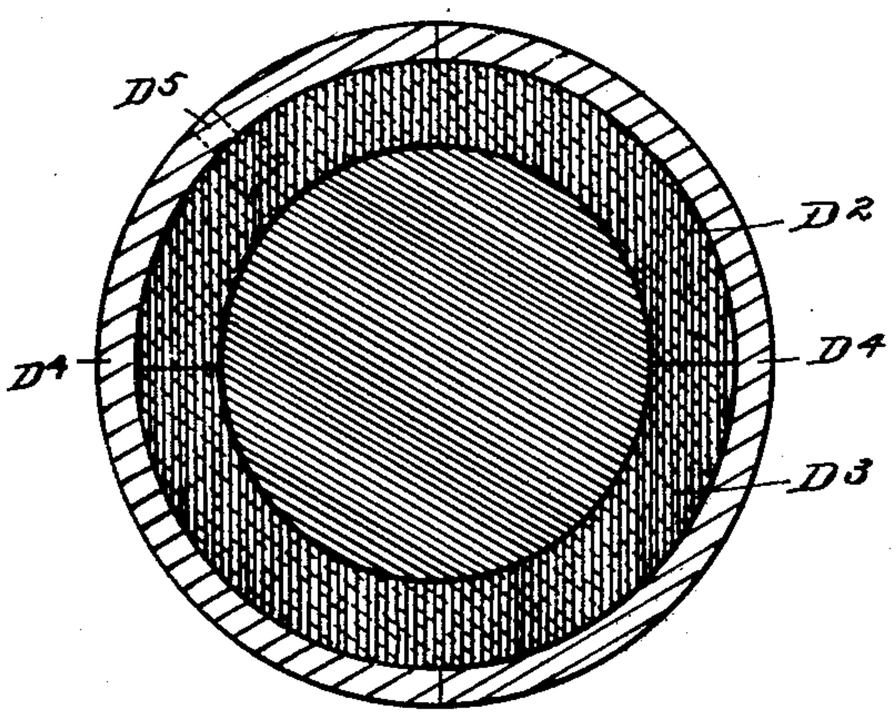


Fig. 4.

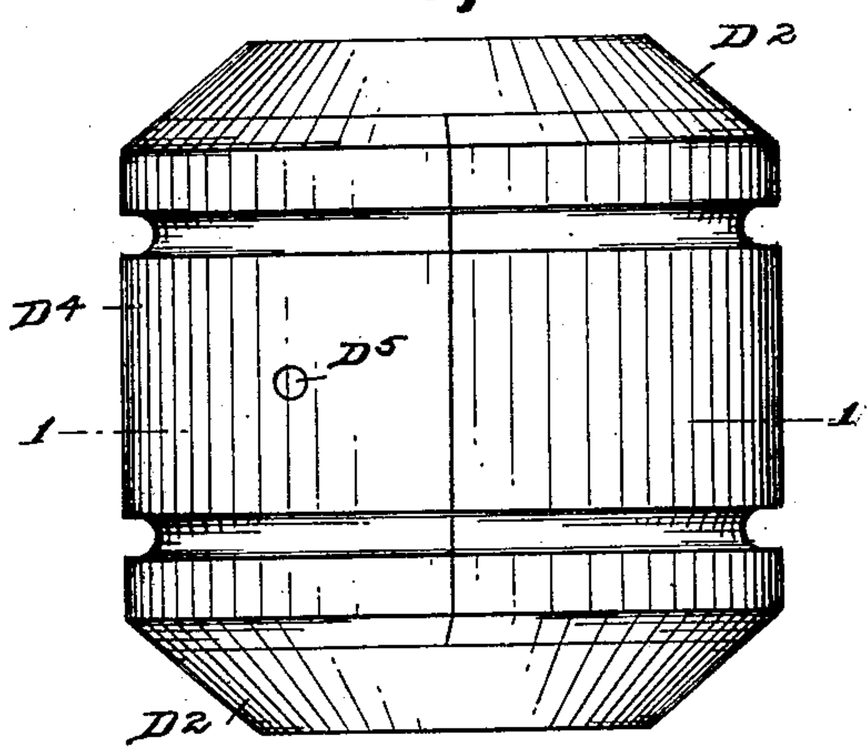


Fig. 7.

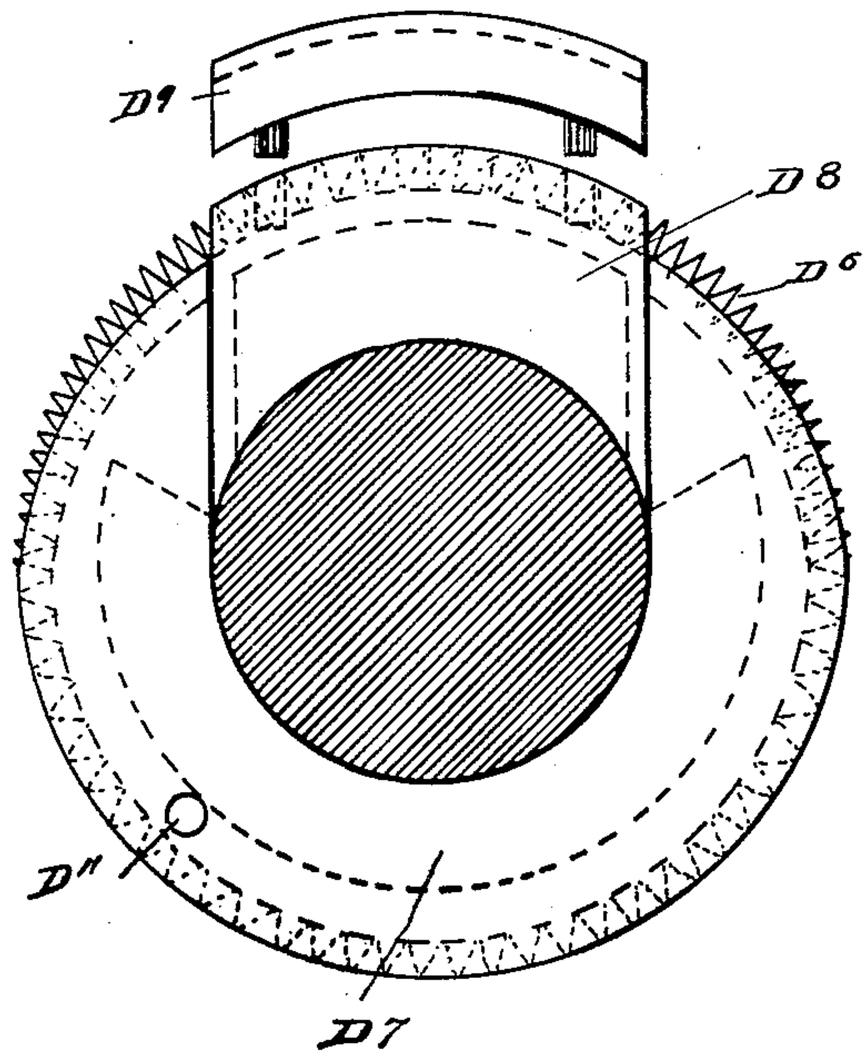
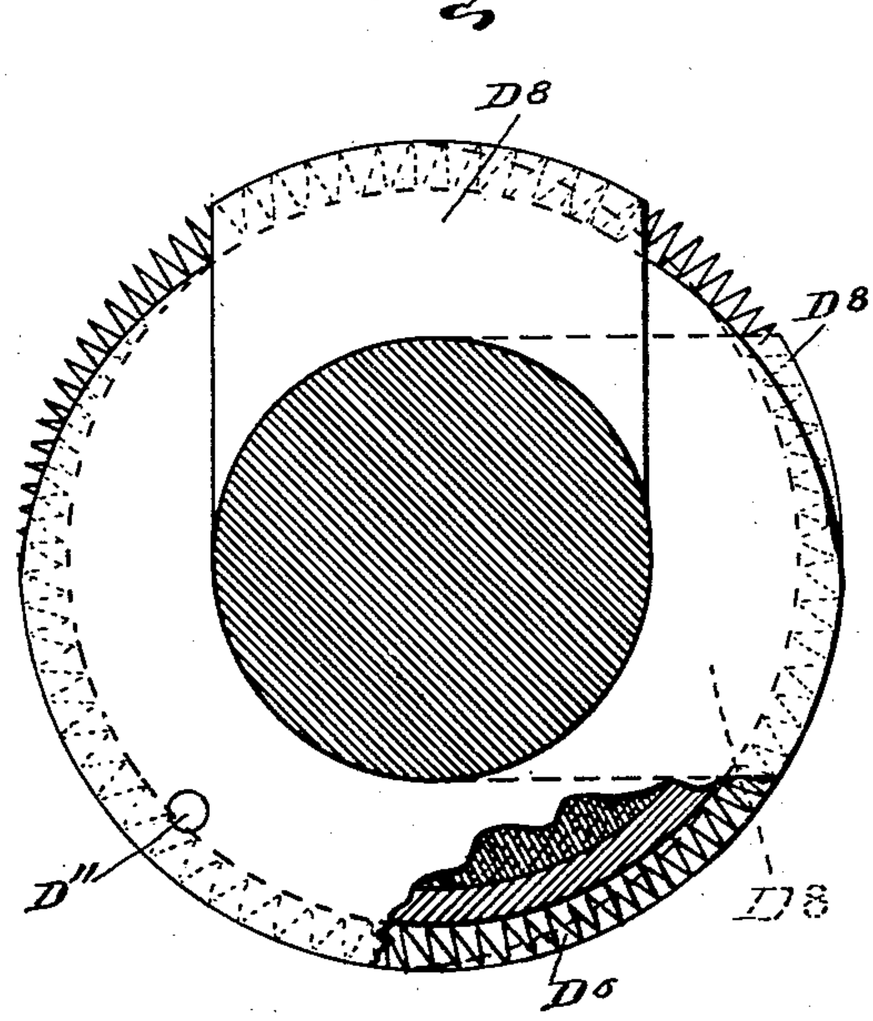


Fig. 6.



WITNESSES:

E. W. Tucker Jr.

M. J. Kuhl.

INVENTOR.

Edwin W. Tucker.

BY Munson & Dale Co

ATTORNEYS.

No. 738,129. PATENTED SEPT. 1, 1903.

E. W. TUCKER.

METALLIC PACKING.

APPLICATION FILED MAR. 21, 1902.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 9.

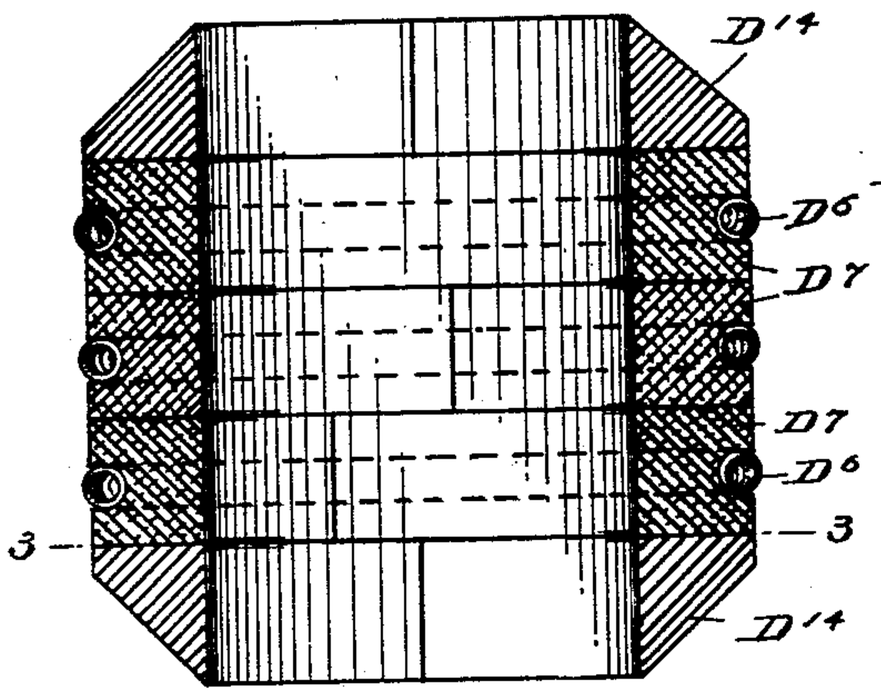


Fig. 8.

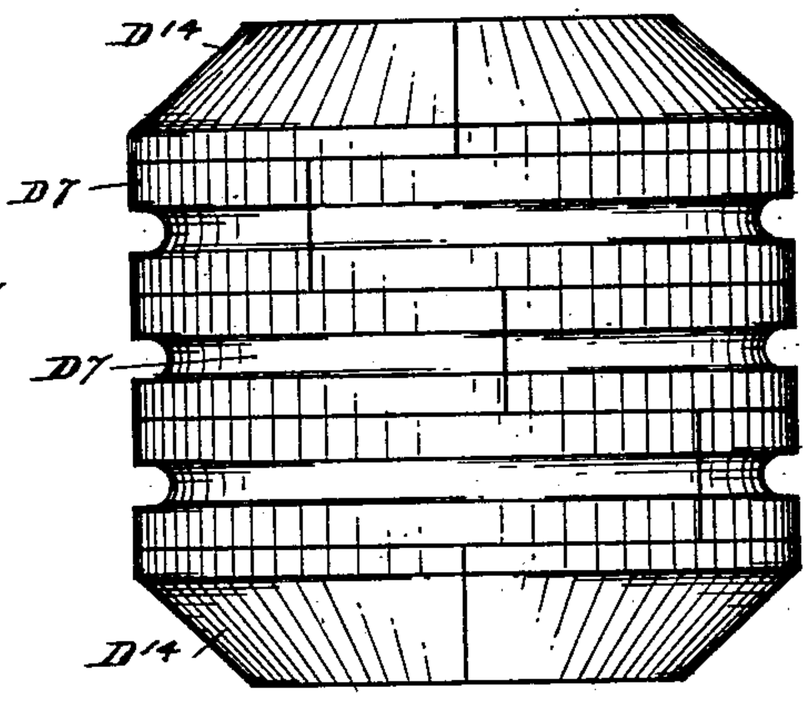


Fig. 10.

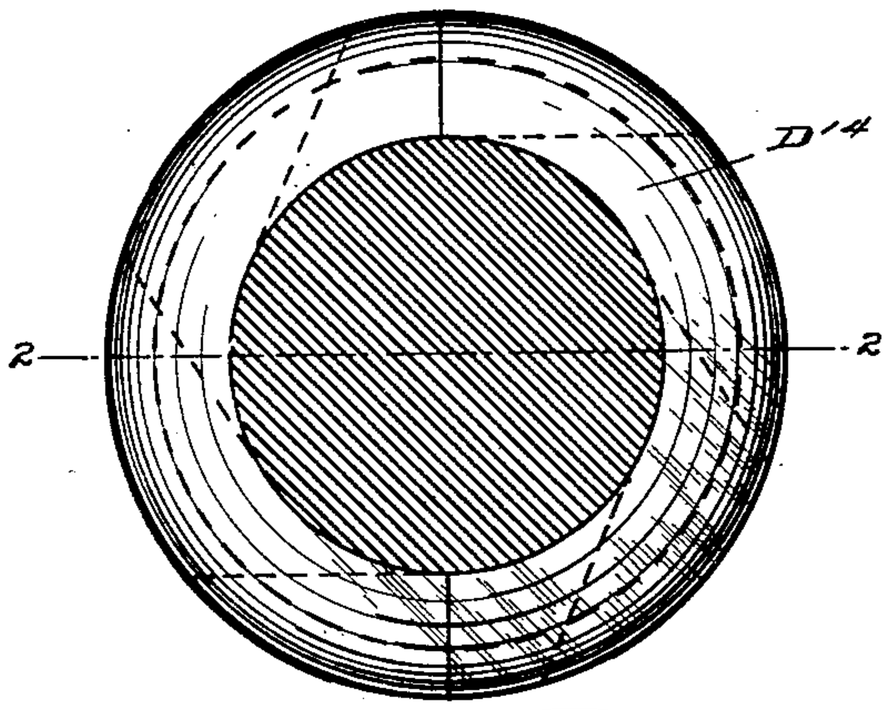


Fig. 11.

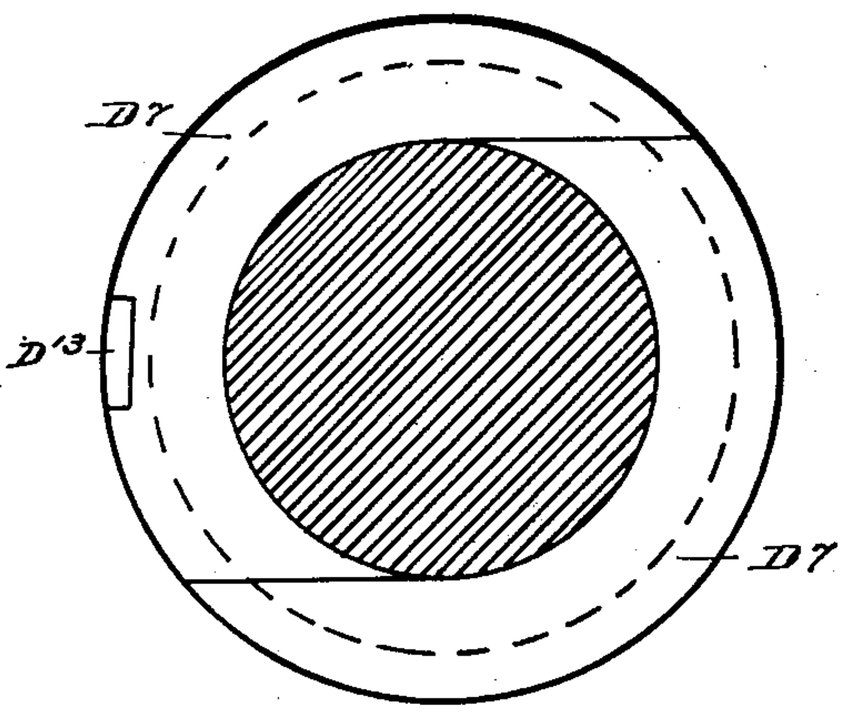


Fig. 12.

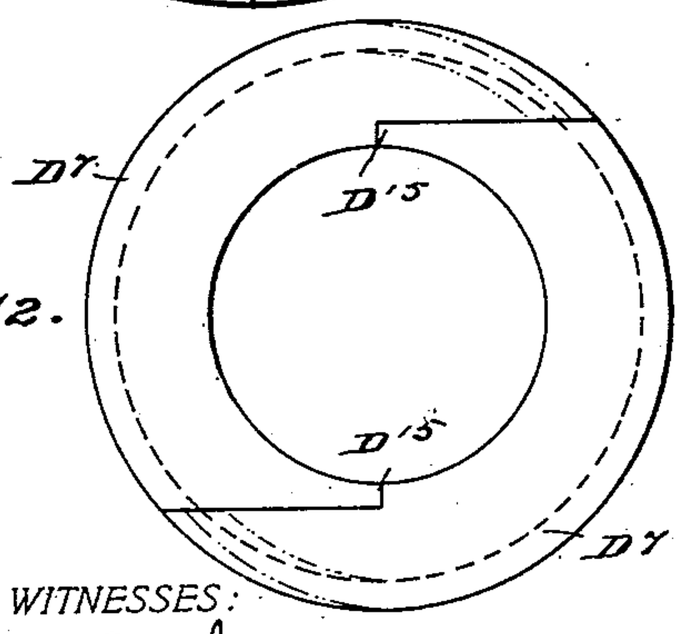
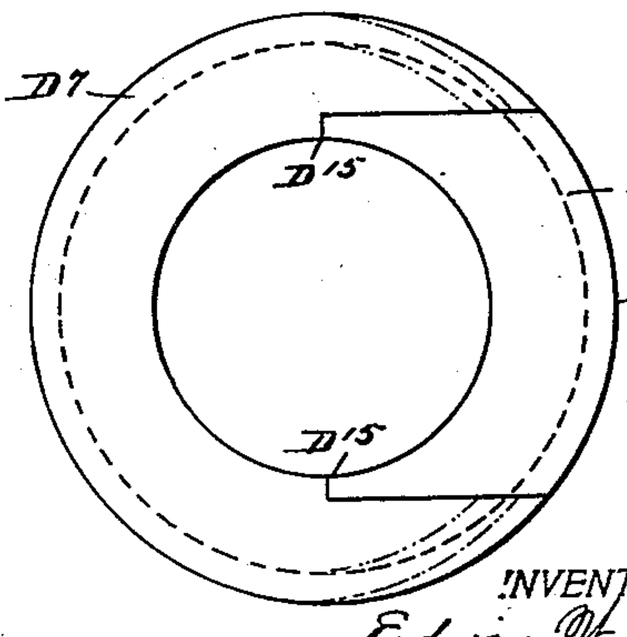


Fig. 13.



WITNESSES:

E. W. Tucker Jr.

W. J. Kuhl.

INVENTOR.

Edwin W. Tucker.

BY Murdock Tate & Co

ATTORNEYS.

No. 738,129. Patented September 1, 1903.

UNITED STATES PATENT OFFICE.

EDWIN W. TUCKER, OF SAN FRANCISCO, CALIFORNIA.

METALLIC PACKING.

SPECIFICATION forming part of Letters Patent No. 738,129, dated September 1, 1903.

Application filed March 21, 1902. Serial No. 99,361. (No model.)

To all whom it may concern:

Be it known that I, EDWIN W. TUCKER, a citizen of the United States, residing at and whose post-office address is 818 Page street, in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Metallic Packing; and I do hereby declare the following to be a full, clear, and exact description of said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

This invention relates to improvements in metallic packing, and particularly the assemblage in the stuffing-box and packing-case of sectional metallic packing for piston-rods, valve-stems, &c.

The objects accomplished by this invention are complete accommodation for the oscillation of piston-rods within stuffing-box and packing-case, accommodation for the diametrical inequalities and surface depression in piston-rods, and to provide a packing compact, effective, and capable of mathematically-calculable alterations to suit various conditions of pressure in the fluid or vapor operated with, and, further, to so construct, combine, and operate the various parts that the adjustments shall remain unaffected by the wearing away of the packing members.

The invention broadly consists of a stuffing-box and packing-case having diametrically-reduced end openings allowing a free play of the piston-rod and having the inner edge of said openings concavely beveled to accommodate ball-shaped members between which compression-rings operate to contract about the piston-rod, a series of packing-rings having cone-shaped ends coöperating with the compression-rings and springs operating between the compression-rings and packing-rings for longitudinal compression, and garter-springs encircling the packing-rings to cause same to hug the piston-rod independent of the compression-rings and fluid-pressure.

In the accompanying drawings the invention is illustrated with particular reference to its application to marine and other upright types of engines.

Figure 1 is a longitudinal cross-section of a cylinder-head, showing a stuffing-box and packing-case constructed in accordance with this invention as applied to inverted cylinders. Fig. 2 is a similar view of the invention as applied to tandem compound engines, the upper representing the high-pressure end and the lower representing the low-pressure, the differentiation in construction of the two sets of packing being disclosed later in the specification. Fig. 3 is a similar view of the invention, the high-pressure packing being inclosed and operating independent of the fluid-pressure of the engine. Fig. 4 is a side elevation of the same. Fig. 5 is a detail in cross-section on the line 1 1, Fig. 4, of the packing-rings illustrated in Fig. 1. Fig. 6 is an end elevation of the sectional packing-ring used in the construction illustrated in lower section of Fig. 3, showing the coöperation of the segmental ring and feed-block, partly broken away to better show construction. Fig. 7 is a similar view showing the application of the supplemental block used when the feed-block has worn away beyond the influence of the encircling spring. Fig. 8 is a side elevation of a built-up packing made up of segmental rings arranged in "break-joint" for use with heavy pressures and where the piston-rod is particularly out of alinement or irregular. Fig. 9 is a cross-section of the same on the line 2 2, Fig. 10. Fig. 10 is an end elevation of the same. Fig. 11 is a cross-section of the same on the line 3 3, Fig. 10. Fig. 12 is an end elevation of the packing-rings when used, showing shoulders to prevent fluid-pressure from exerting undue friction against piston-rod. Fig. 13 is a similar view showing one of the shoulders operating in reverse direction.

In the description with reference to the drawings similar letters designate similar parts throughout the several views.

In construction the invention consists in placing in the top of the usual stuffing-box A the annular seat B, of suitable wearing texture, concavely beveled on the inner surface to accommodate the convex bevel on the bearing-ring B′. The ring B′ is directly supported by the cushioning-springs C^2, placed at intervals in the compression-ring C′. The compression-rings C′ and C^2 have an internal flat bevel overriding the cone ends of the packing-ring D, extending between the said rings. The ring C^2 abuts the bearing-ring B^2, which

coöperates with seat B^3 to form a steam-tight ball-joint.

The parts in the combination just described are kept seated (that is, in close contact with their respective coöperative parts) by the cushion-springs C^2. In this manner all lost motion is eliminated and hammering prevented and provision made for expansion and contraction of the metal.

A plurality of packings may be used in a single set of packing by interposing the duplicating double-beveled compression-ring C^3, Fig. 1.

The packing-ring consists of an annular block divided on its diameter into separate pieces fitted together with a mortise-joint, formed by setting the block in a lathe and turning a circular cut D′ in the faced edge of the female block D^2 transverse of its bore to engage a projection similarly formed on the male block D^3, or the parts may be joined by a straight offset joint, as shown in dotted lines, Fig. 3.

The packing-ring blocks D^2 and D^3 are formed of a bland metal of even texture, good wearing qualities, and absolutely free from a disposition to cut the piston-rod. For this purpose I use a metal of my own composition known as "Tucker metal," resembling Babbitt metal. After the blocks D^2 and D^3 are faced, jointed, and bored the metal shell (brass) D^4, in two sections, is fitted over them, the joints in the shell being offset or out of coincidence with the joints in the blocks, the blocks and shell having external and internal grooves, respectively, engaging to cause the pressure-breaker thus built up to act as an integral whole. The pin D^5, riveted to the shell and projecting inwardly, engages a hole in one of the blocks to maintain the permanency of the break-joint between them and the shell. (See Fig. 5.) The garter-springs D^6 encircling the packing-rings cause it to hug the piston-rod, at all times keeping the parts snugly in place. Particular attention is directed to the angle of the cone ends of the pressure-breaker. The fluid-pressure acting upon the compression-rings drives them against the ends of the packing-rings, causing a contractile action therein proportionate with the fluid-pressure exerted. The pressure to be overcome being known, the angle is made to correspond.

In tandem compound engines—that is, where two degrees of pressure are exerted upon the same piston-rod—the packing is duplicated, as in Fig. 2. This double use is effected by interposing the annular separating middle section B^4, having contraposed concave bevels to accommodate the bearing-rings B′ and B^2. This section is held in place by the packing-case A′, bolted to the face of the cylinder-head coincident with the bore of the stuffing-box. The packing-case A′ has the annular channel A^2 adjacent to the seat B^3 filled with a soft material or wiper, which is kept saturated with oil, which is carried into the packing-case by the reciprocations of the piston-rod. To prevent the soft material or wiper from working into the bearing-seat B^3 or interfering therewith, the internal annular flange A^3 is interposed. The difference in the angle of taper in the two sets of pressure-breakers in Fig. 2 is for the purpose specified with regard to the differing fluid-pressures, the upper section being high, the lower section being low pressure.

A further advantage in the double use of the complete packing in one stuffing-box (even with only one fluid-pressure acting upon the piston) is that it allows a long packing to be used, at the same time taking up the oscillation of the piston-rod with four ball-joints. The transverse strains are more evenly distributed throughout the packing, adding to its life and efficiency. Where desirable, one set of packing may be reversed—that is, the compression-rings C′ may be placed at both extremes of the stuffing-box and packing-case adjacent the bearing-rings B′ and B^2.

A modification of the double use above described is illustrated in Fig. 3, wherein very high pressures are to be handled. The upper section remains unaltered, except that the internal bearing-surface of the packing-ring is increased. In the lower section the compression-ring C′ is supplanted by the annular casing C^4, having the head C^5 tightly fitted therein to form, in connection with the piston-rod, a casing as nearly as possible hermetical. In this manner the packing-blocks are insulated from the extreme high fluid-pressure, which is likely to interfere with its proper working. The sections of the packing in this instance are made up of flat segmental rings D^7, open to pass the piston-rod, the ends being adjacent and parallel to admit the feed-block D^8. The outer perimeter of the ring D^7 is elliptical to permit the encircling spring D^6 to engage the feed-block D^8 to keep same seated against the piston-rod. As the feed-blocks wear away beyond the influence of the spring they are pieced with the extension-pieces D^9. The rings D^7 and feed-blocks D^8 consist of a hollow brass casing filled with Tucker metal before finishing. (See dotted lines and broken-away portions of Figs. 6 and 7.) The rings D^7 are placed in the casing C^4, with the feed-blocks placed on the quarter. (See Fig. 6, dotted lines.) In this manner a lateral pressure is exerted throughout the circumference of the piston-rod. The separating-plate D^{10} is interposed between the rings D^7 to prevent them "freezing together." This is liable to occur, particularly if the ring is made integrally of Tucker metal without the brass casing. The rings are prevented from turning upon the piston-rod by the recesses D^{11} engaging a pin extending through the separating-washer D^{10}.

Figs. 8 to 11, inclusive, illustrate a pressure-breaker made up of segmental rings B^{12}, divided tangenitally from the center bore and from opposite sides of the bore, the com-

plete rings being circumferentially grooved to accommodate the garter-springs D^6. The rings are built up around the piston-rod in break-joint—that is, with no two joints coinciding. This order is preserved by means of interlocking lugs and recesses D^{13}. The cone ends D^{14} may be divided tangentially or at right angles, the latter being cheaper and practically as effective at this particular point. This type of packing is particularly desirable in repair-work where the piston-rod is badly out of alinement or uneven. The cone-end rings are bored to snugly pass the largest diameter in the piston-rod. The rings D^7 being expansive, hug into depressions in the rod. On an uneven rod the packing-rings can be seen to "breathe" as the inequalities pass through it.

The constructions illustrated in Figs. 12 and 13 show the form given the packing-rings D^7 when used as packing for heavy pressures. The rings are fitted snugly to the smallest part of the piston-rod and held in place by the garter-springs D^6, which allow a lateral outward movement. The shoulders D^{15} prevent the enveloping fluid-pressure forcing the parts inwardly against the piston-rod and producing undue friction.

To properly perform their function, the annular compression-rings C' C^2 and casing C^4 must have an unbroken continuity. This necessitates under certain conditions the insertion of the annular segments C^6 adjacent the piston-rod. (See Fig. 3.) This construction permits the rings to pass any enlargement on the end of the piston-rod.

The annular extension A^4 from the stuffing-box into the cylinder inclosing the piston-rod is provided to prevent condensation draining into the stuffing-box. To relieve any flooding that may occur in the stuffing-box, the drain A^5, connected with the condenser, is provided.

Having thus described this invention, what is claimed, and desired to secure by Letters Patent, is—

1. In a packing for piston-rods, the combination with an inclosing casing, of a series of soft-metal packing-rings, garter-springs encircling said packing-rings, a hard-metal casing surrounding said packing-rings and springs, and springs seated in a portion of said hard-metal casing and adapted to keep the said packing-rings in close relation.

2. In a packing for piston-rods or the like, the combination with an inclosing casing, of a series of packing-rings comprising soft-metal interiors and harder-metal casings, means abutting said soft-metal interior to cause constriction to the piston-rod, and auxiliary means to assist in said constriction.

3. In a packing for piston-rods or the like, the combination with an inclosing casing, of a series of packing-rings, comprising soft-metal interiors and harder-metal casings, means abutting said soft-metal interiors and said harder-metal casings to cause constriction to the piston-rod, and annular springs encircling said harder-metal casings to assist in said constriction.

4. In a packing for piston-rods or the like, the combination with a stuffing-box, of a series of packing-rings having cone-shaped end rings, cups fitting said cone-shaped end rings, annular rings having a convex surface, seats in the stuffing-box to receive the convex surface of said annular ring, said seats and annular ring free from the piston-rod, and cushion means seated in said cups and abutting said annular ring, whereby it is allowed free oscillation upon the seats.

5. In a packing for piston-rods or the like, the combination with a stuffing-box, of a series of diametrically-split packing-rings, a casing inclosing said packing-rings, an annular ring having a convex surface, means seated in said inclosing casing and abutting said annular ring for forcing the packing-rings into contact, and garter-springs within said casing and encircling said packing-rings whereby they are held in contact with the piston-rod.

6. In a packing for piston-rods or the like, the combination with a stuffing-box, of a series of packing-rings consisting of diametrically-split soft-metal interiors, open rings arranged in break-joint and forming a casing for the soft-metal interior, springs encircling said rings and tending to constrict them, and means on the rings for holding them in break-joint relation.

7. In a packing for piston-rods or the like, the combination with a stuffing-box, of a packing-case, an annular partition held in place between the stuffing-box and packing-case and having contraposed concave bevels, convex-faced bearing-rings abutting against same, a series of split packing-rings having cone ends, annular pressure-rings abutting against said cone ends, and springs seated in said pressure-rings adapted to hold the parts in proper relation on the piston-rod.

8. In combination with a packing for piston-rods, a split packing-ring consisting of a soft-metal interior having depressions therein, a hard-metal casing surrounding said soft-metal interior, depressions in its exterior adapted to receive garter-springs, said depression forming raised portions on its interior which prevents longitudinal displacement on the soft-metal interior.

9. In a packing for piston-rods, and like constructions, the combination with an inclosing stuffing-box, of a plurality of packing-rings divided diametrically, said diametrical division having a lateral offset; resilient members encircling said packing-rings; annular ball-shaped members abutting the ends of said packing-rings; seats in the stuffing-box to receive, and upon which said ball-shaped members are adapted to rock and turn; substantially as described.

10. In a packing for piston-rods, the combination with an inclosing casing, of a series of soft-metal packing-rings, hard-metal partitions between said soft-metal packing-rings, springs surrounding said packing-rings and normally tending to constrict them, a hard-metal casing surrounding said packing-rings and partitions, and means seated in a portion of said casing for holding the packing-rings and partitions in close relation.

In testimony whereof I have hereunto set my hand this 11th day of March, 1902.

EDWIN W. TUCKER.

Witnesses:

BALDWIN VALE,

G. F. HATTON.