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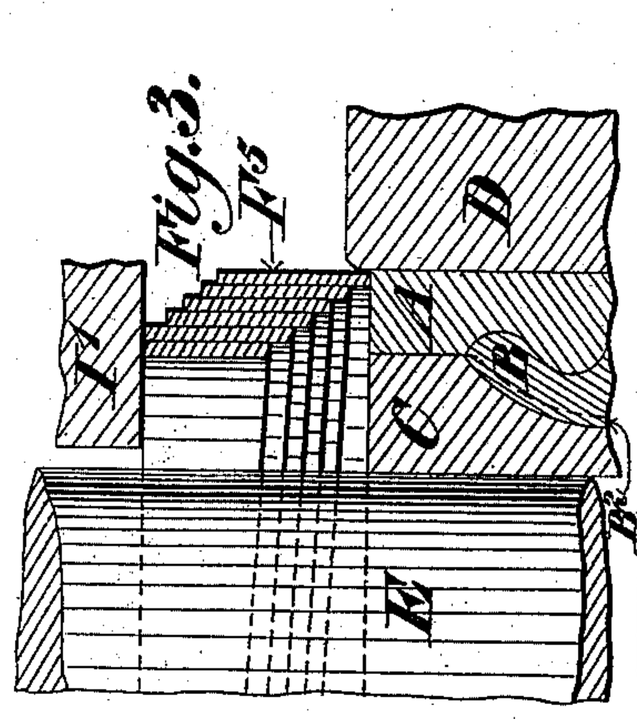
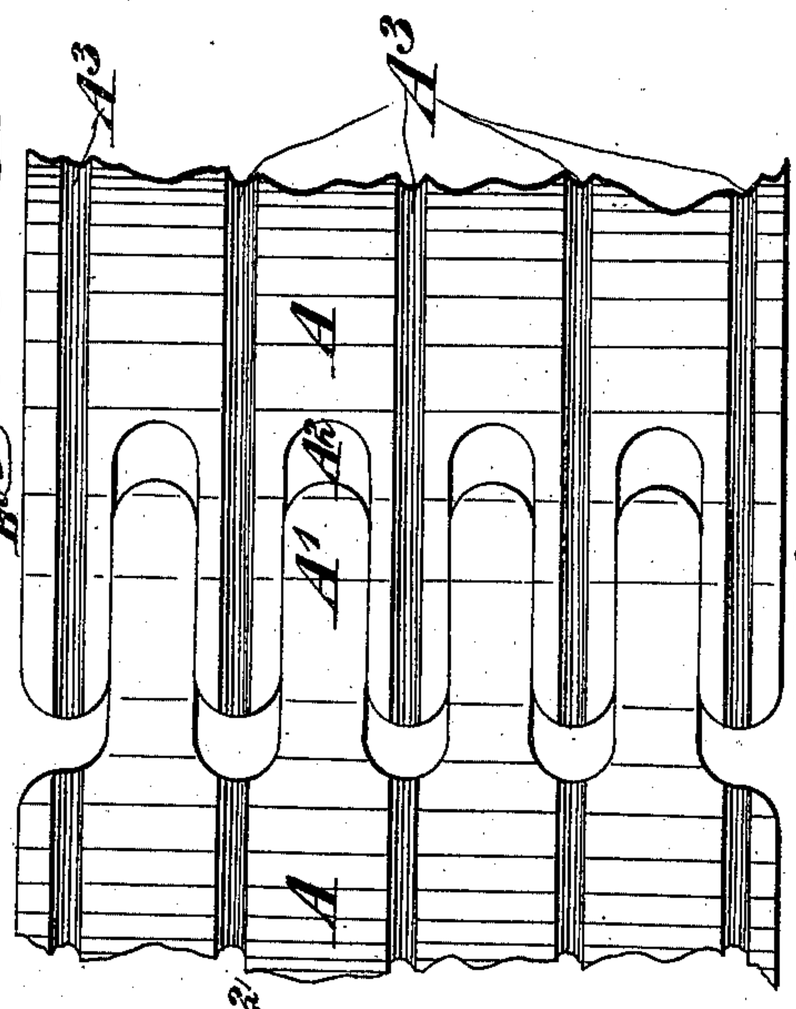
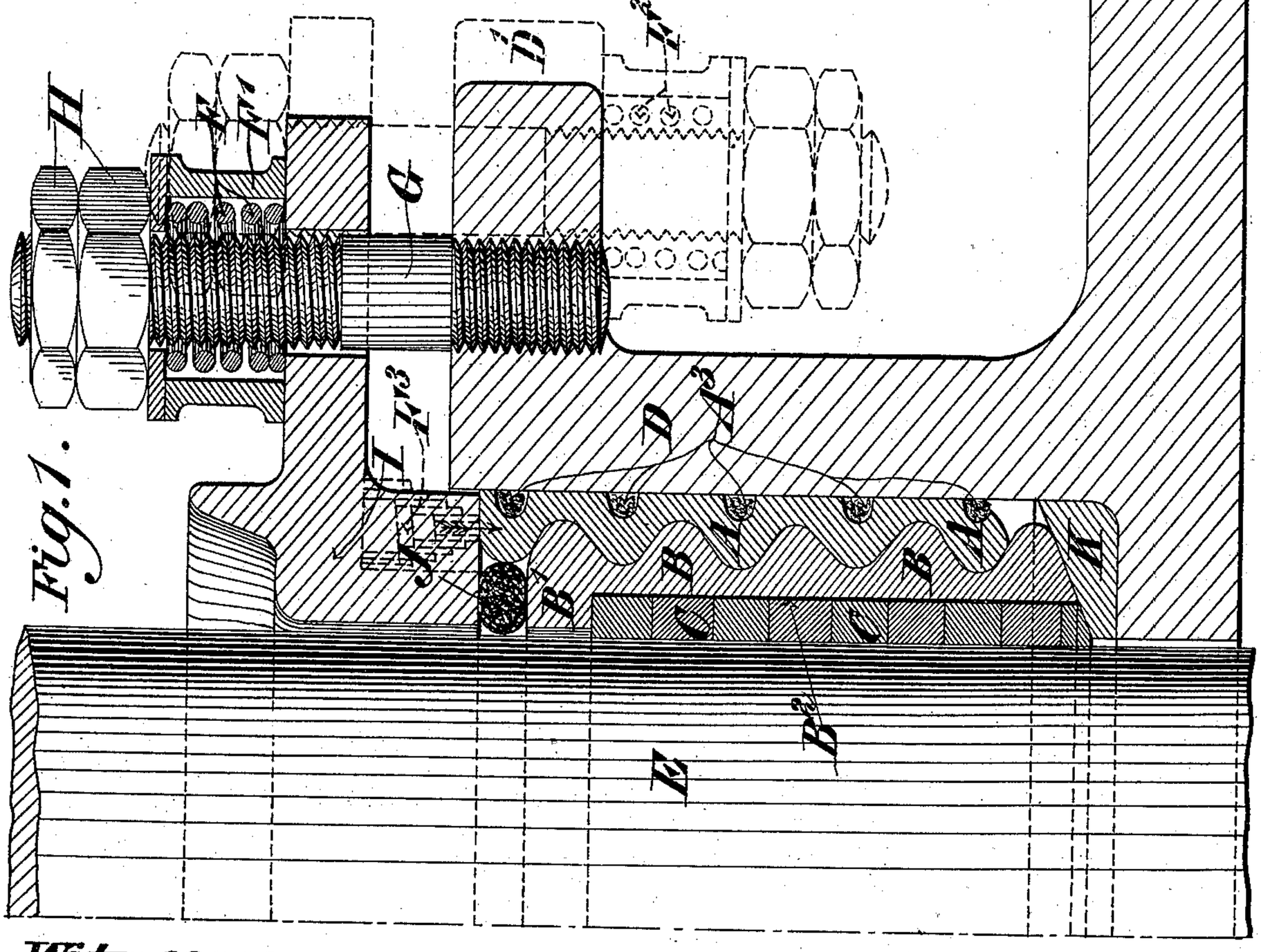
H. C. PLATTS & T. LOWTHER.

PACKING.

No. 548,089. Patented Oct. 15, 1895.







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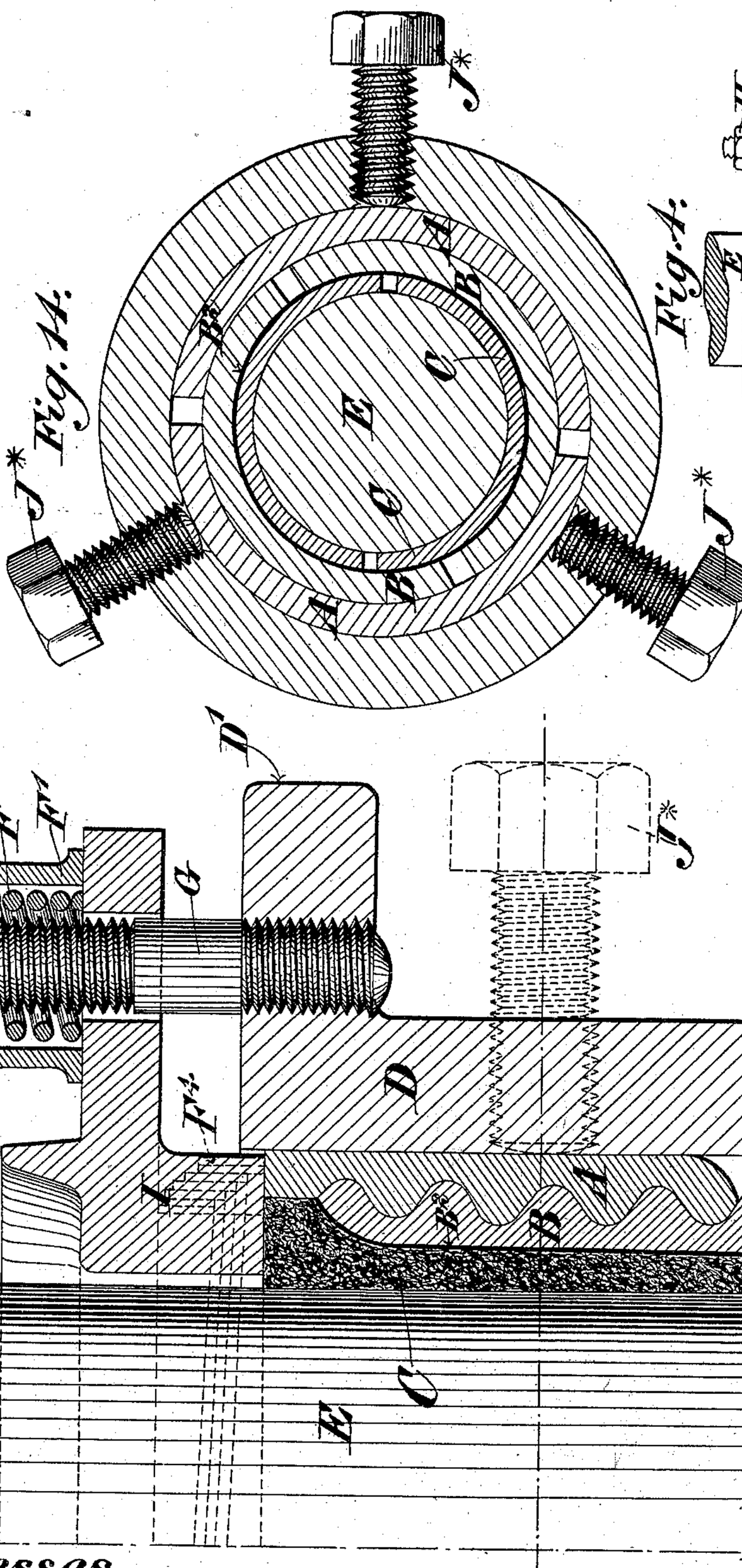
(No Model.) 4 Sheets—Sheet 2.

H. C. PLATTS & T. LOWTHER.

PACKING.

No. 548,089. Patented Oct. 15, 1895.



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(No Model.) 4 Sheets—Sheet 3.

H. C. PLATTS & T. LOWTHER.

PACKING.

No. 548,089. Patented Oct. 15, 1895.

Fig. 6.

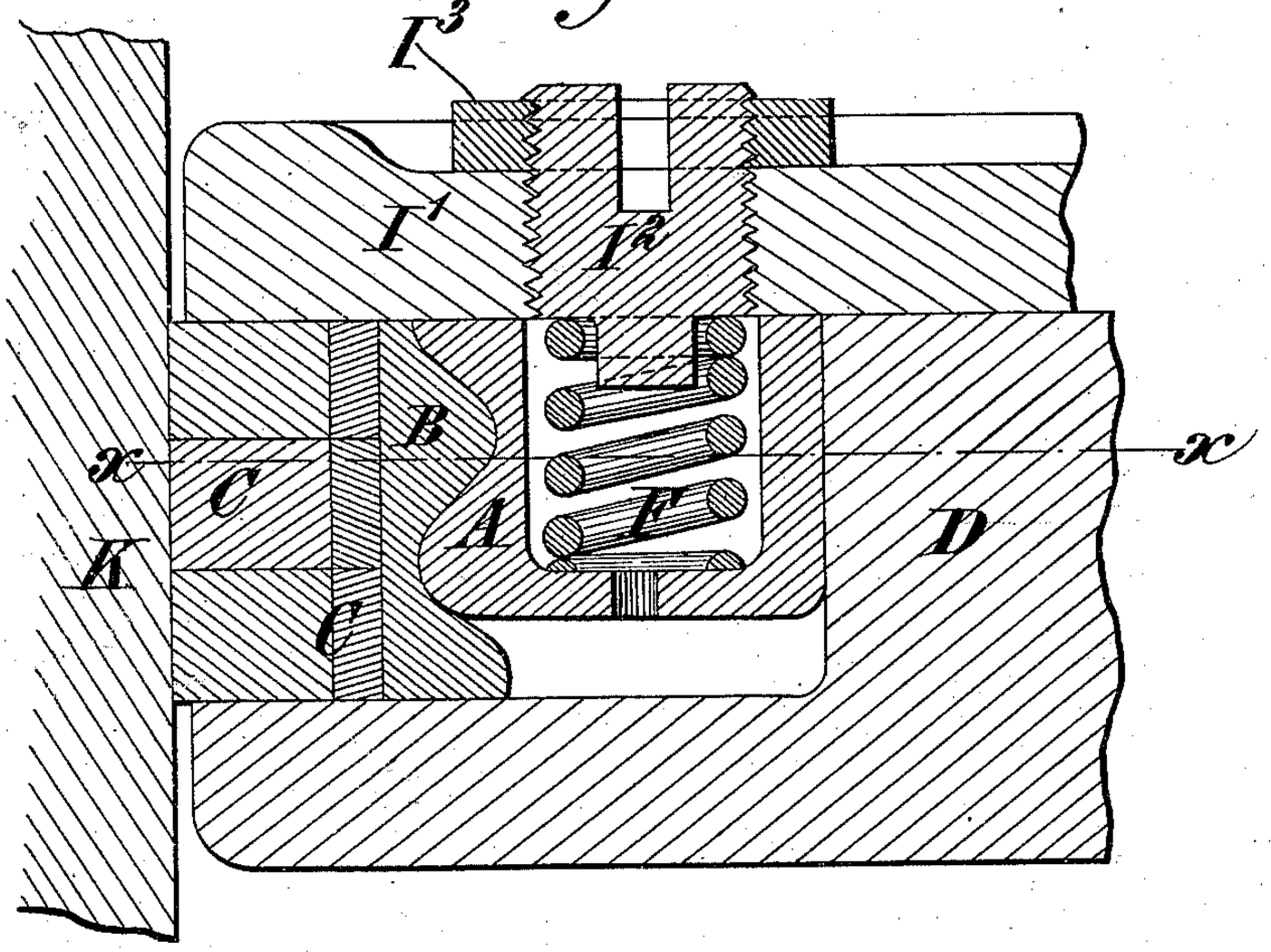
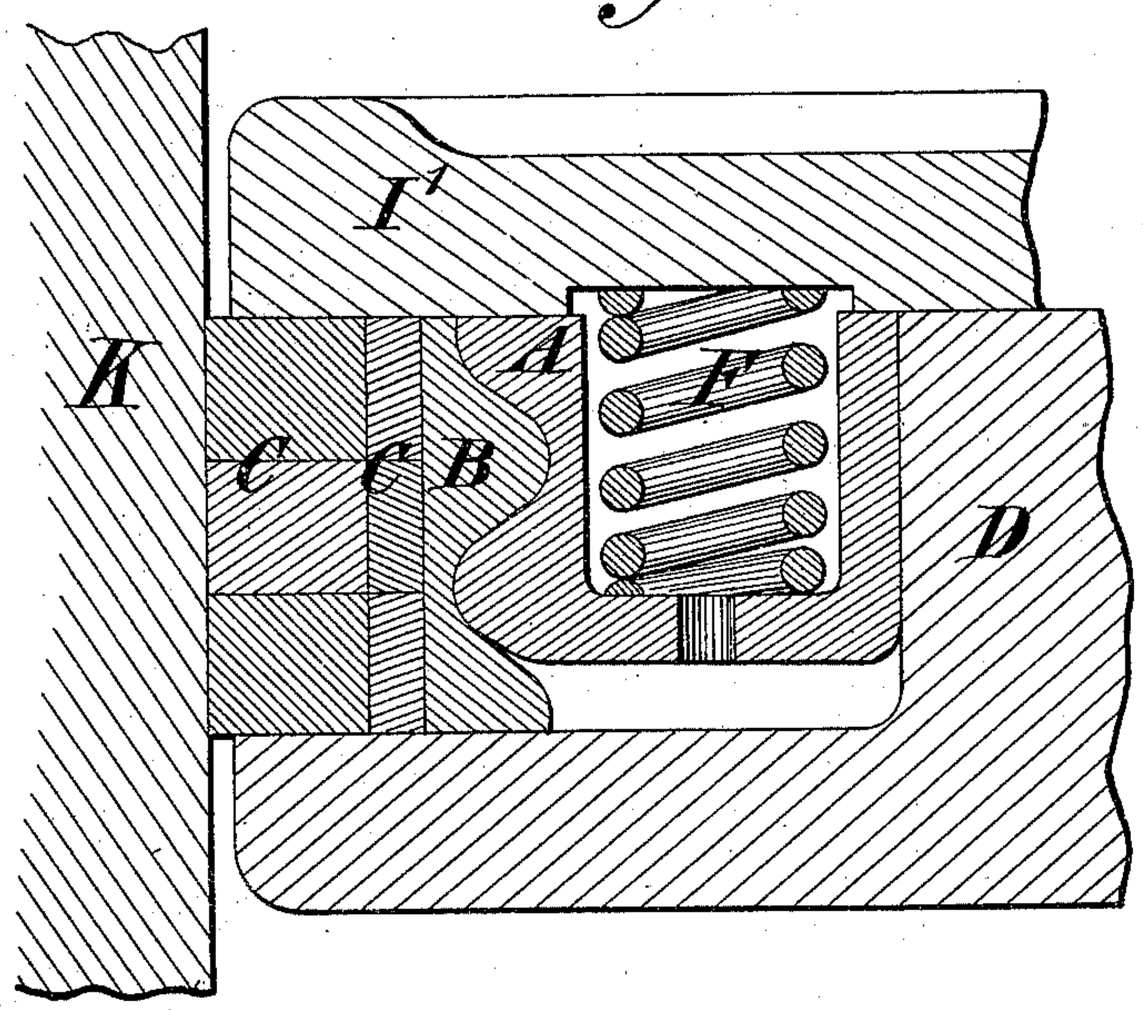


Fig. 5.



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(No Model.) 4 Sheets—Sheet 4.

H. C. PLATTS & T. LOWTHER.

PACKING.

No. 548,089. Patented Oct. 15, 1895.

Fig. 8.

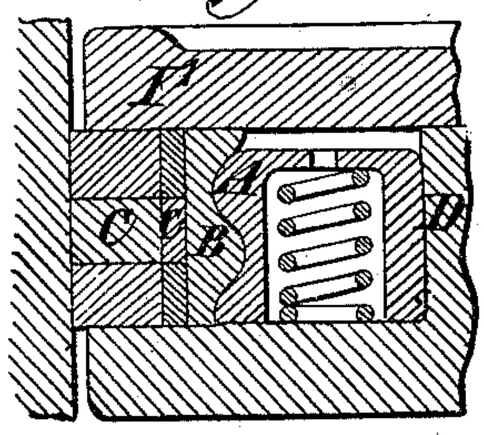


Fig. 9.

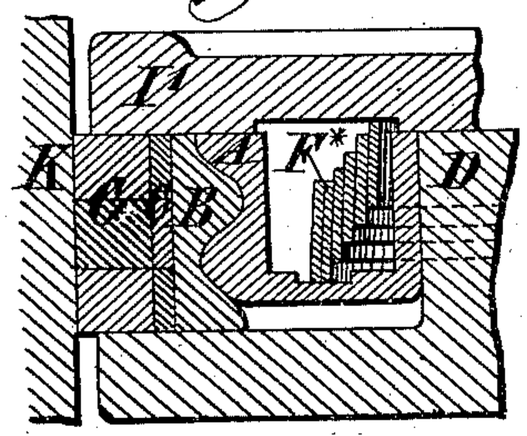


Fig. 10.

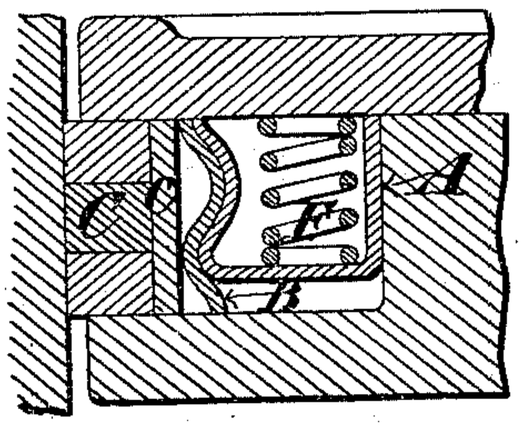


Fig. 7.

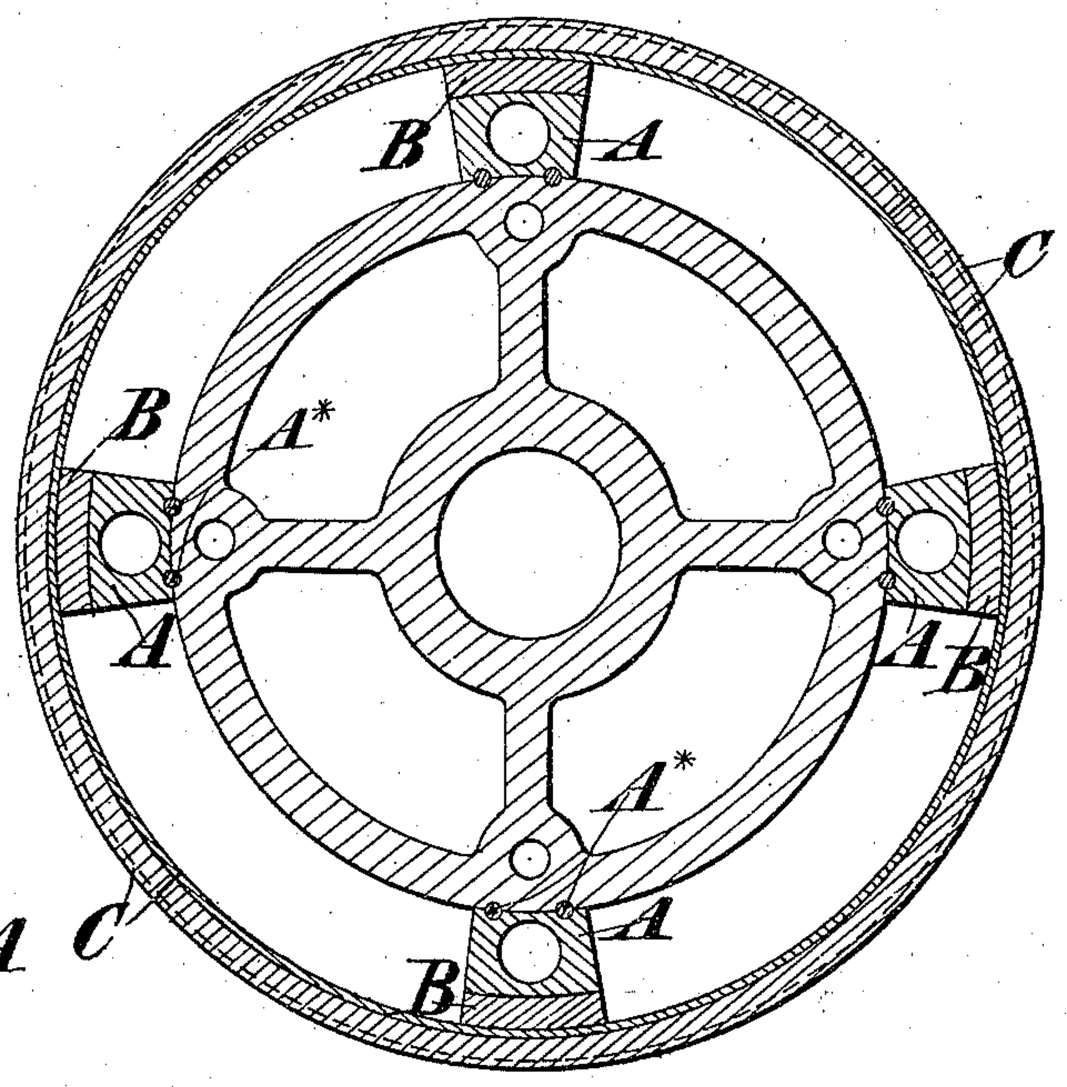


Fig. 11.

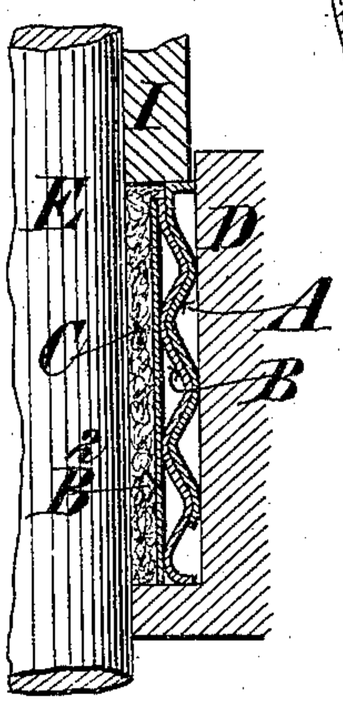
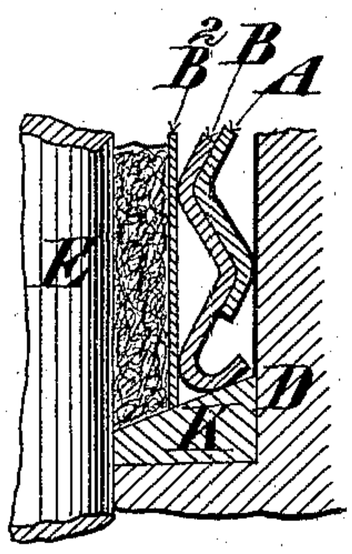


Fig. 12.



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UNITED STATES PATENT OFFICE.

HENRY CHARLES PLATTS AND THOMAS LOWTHER, OF HUGHESOFFKA, RUSSIA.

PACKING.

SPECIFICATION forming part of Letters Patent No. 548,089, dated October 15, 1895.

Application filed September 14, 1893. Serial No. 485,532. (No model.) Patented in England February 23, 1893, No. 4,044.

To all whom it may concern:

Be it known that we, HENRY CHARLES PLATTS and THOMAS LOWTHER, subjects of the Queen of Great Britain and Ireland, residing at Hughesoffka, a government of Ekaterinoslav, South Russia, have invented Improvements in Packing, (for which a patent was granted in Great Britain February 23, 1893, No. 4,044,) of which the following is a specification.

This invention has reference to improvements in or relating to packing arrangements such as are used for piston-rods, valve-spindles, pistons, screw-propeller stern-pipes, and generally for producing fluid-tight joints, and is designed to provide for automatically tightening up the packing to compensate for wear. According thereto the packing is constantly pressed against the surface with which it is to form a fluid-tight joint by a tightening device comprising bushes or tubes or segments of bushes or tubes arranged in pairs and each adapted to act after the manner of a wedge against the other of the pair, so that the one nearest the packing will be caused to press the same inward or outward, as the case may be, the wedging action being automatically produced by a spring or springs acting directly or indirectly on one or other of the bushes or tubes or segments of the pair or of each pair when there is more than one pair.

In the accompanying drawings, Figure 1 shows partly in longitudinal half-section and partly in elevation a stuffing-box for a piston-rod with tightening device and means for automatically operating the same according to this invention. Fig. 2 shows a convenient form of joint for the adjacent edges of the bush-segments forming part of the tightening device. Figs. 3 and 4 are respectively a sectional elevation and a side elevation showing modified arrangements of springs. Figs. 5 and 6 are part longitudinal sections of pistons fitted with tightening devices according to this invention. Fig. 7 is a cross-section on the line $x\,x$ of Fig. 6, but drawn to a smaller scale, showing an engine-piston having our improvements applied thereto. Figs. 8 to 12, inclusive, are vertical sections illustrating modified arrangements. Fig. 13 is a corresponding view to Fig. 1, showing an additional device for tightening the packing. Fig. 14 is a cross-section showing the application of our invention to a stuffing-box for a screw-propeller shaft. Fig. 15 is a detail view. The several figures are drawn to different scales.

In the arrangement shown in Figs 1 and 2, which is suitable for a stuffing-box for a piston-rod, plunger, valve-spindle, or the like, and provided with packing of any suitable kind, such as metallic, asbestos, vegetable, or composite packing, there are two bushes A and B placed around the packing C, between it and the cylindrical inner face of the stuffing-box D. The bush A in packing arrangements according to this invention may be made in one piece and either with or without a longitudinal slit or it may be made in two or more segments. The bush B may be made in one piece with a longitudinal slit or it may be made in two or more segments. When the bushes are made in the form of longitudinally-slotted tubes, they should be made thin and flexible, in order that they may be easily sprung over the rod-plunger or the like with which they are to be used, and so that when in position in the stuffing-box the bushes B can be easily compressed by the action of the springs. In the example now being described it is assumed that the bushes are each made in several segments. The adjacent surfaces of each pair of these segments are toothed or corrugated in a circumferential direction, as indicated, the teeth or projections of the outer segments A acting when pressed endwise in the direction of the arrow against the teeth or projections of the inner segments B, after the manner of wedges, and forcing the said inner set of segments radially toward the packing, which is thereby kept tightly in position against the rod-plunger or spindle E to be packed. The segments of the outer bush A are forced endwise by coiled, volute, or other springs F F, each preferably arranged in a spring-box F′, surrounding a tightening-bolt or stud G and interposed between the nuts H, that usually serve for adjustment, and the gland I of the stuffing-box. This gland bears on the segments of the outer bush A and forces them endwise by the action of the aforesaid springs F, which can be tightened up as required by the adjusting-nuts H.

By providing the adjacent faces of the bushings with curved or rounded corrugations friction and wear are greatly reduced and also there is a great saving in packing. The bush bearing-surfaces being rounded are more sensitive to longitudinal pressure, responding more quickly thereto than where the bushes are formed with angular corrugations and flat bearing-surfaces, as in patent to Houston, No. 488,434, dated December 20, 1892, for in the bushes of this latter class much more friction exists than where the contact-surfaces are rounded, thus requiring greater longitudinal pressure to maintain a tight joint. A further advantage is that owing to the comparative small amount of friction between the outer and inner bushes the longitudinal adjusting means may be fixed to a nicety, thus avoiding unnecessary retarding pressure on the piston and consequent destruction of packing. Continued wear upon the rounded corrugations has for its effect only to flatten or enlarge the curves of the corrugations, while in flat bearing-surfaces constant back-and-forth motion is likely to cause ridges to form thereon, thereby greatly retarding the effectiveness of the packing device.

The inner segments B may, as shown in Fig. 1, have a flange B′ to keep the packing C in place, and a layer of fibrous or asbestos packing J may be placed between the gland I and the said flange to hold lubricant. The flange B′ on the segments B and the packing J may, however, be dispensed with and the gland I may be arranged to act, as shown in Fig. 13, directly on the bush A and also on the asbestos or other fibrous packing C.

The inner segments B may rest on or bear against a ring K* at the inner end of the stuffing-box, as shown in Fig. 1, this ring having the surface against which the segments bear beveled or inclined downward and inward to assist the action of the outer segments A and the movement of the inner segments B. The packing C may also rest upon the said ring, as shown. This ring K*, instead of being beveled, may in some cases be made flat—*i. e.*, with its two sides parallel with each other—or it may be dispensed with, the segments B and packing then resting directly against the inner end of the stuffing-box. The bushes being made in segments, as is also the packing, if metallic, can be removed and renewed without taking off the cross-head or other similar mechanical contrivance that may be fixed to the rod, plunger, or spindle to which the packing is applied. The longitudinal edges of the segments of each bush may be arranged parallel and at a short distance apart or so as to overlap each other. In the lap-joint which we sometimes employ each edge portion is formed, as shown in Fig. 2, with projections A′ and recesses A^2, which fit into each other; but any other suitable form of lap-joint may be used.

We may employ as a convenient backing for the packing C a thin flexible bush B^2, arranged between the bush B or segments thereof and the said packing C. This flexible bush may be made in segments or may be made in a single tubular piece, with its longitudinal edges thinned down and arranged to overlap each other. This thin flexible bush is suitable for the stuffing-box shown in Fig. 1 and also for that shown in Fig. 13, which is hereinafter described. This flexible bush B^2 is shown in Figs. 1, 13, and 14, while in Fig. 15, which is drawn to a larger scale, the overlapping thinned ends of the said bush B^2 are clearly shown.

The bush A may advantageously be provided externally with grooves A^3, Fig. 1, which not only serve to lighten the bush, but also to hold packing in order to insure a fluid-tight joint between these grooves and the interior of the stuffing-box D.

The spring or springs which we employ for the purpose of automatically tightening up the packing C may obviously be constructed in various forms and be arranged in different positions. Thus each spring may be applied under the flange D′ of the stuffing-box D, as shown in dotted lines at F^2 in Fig. 1, either as a spiral spring, as shown, or as a volute, india-rubber, or other spring. The spring may also be applied between the gland I and the bush A, as shown in dotted lines at F^3 in Fig. 1, either as spiral, volute, india-rubber, or other springs, a suitable recess or recesses being provided in the gland I for the reception of the said springs; or a large spiral, volute, or other spring may be arranged between the entire circumferential top surface of the bush A or the segments thereof and the gland I, as shown in dotted lines at F^4 on Fig. 13, a suitable recess for the said springs being made in the gland I, as shown; or the last-described spring arrangement may be arranged between the gland I and the bush A in the manner shown at F^5 in Fig. 3. A spring or springs may also be employed for the same purpose, arranged as shown in Fig. 4, in which a spring F^6, made of zigzag shape, is arranged to exert its pressure from the under side of the gland or plate I to the top surface of the bush A and cause the same action as that of the other springs just described. We may use the springs F or F^2 or F^3 or F^4 or F^5 or F^6 alone, as already described, or combined. Thus we might in some cases employ springs F with either spring F^2 or F^3 or F^4 or F^5 or F^6 or with two or more of such springs, in order to produce a greater effect.

In Figs. 5 and 6, which illustrate the application of this invention to pistons and the like wherein the packing is pressed outward, the bushes A and B are inserted behind or within the packing-rings C C, and the springs E are inserted in suitable recesses in the inner bush. The bushes A and B in this arrangement may, as before, be each made in

one piece or in several pieces or segments, as desired. It is assumed that they are made in segments.

In the arrangement shown in Fig. 3 the springs F are compressed by the junk-ring I′, so that they force the segments of the said inner bush A away from the junk-ring and against the toothed corrugated surfaces of the segments comprising the outer bush B. This action causes the outer segments to be pressed outward against the packing C, thereby tightening up the same against the cylinder-wall K. The arrangement shown in Fig. 6 is designed to more readily adjust the pressure of the springs and to facilitate examination. In this case a screw-stud I^2 is tapped through the junk-ring I′ opposite each spring, so that the spring is caused to abut against the end thereof. This screw-plug is preferably provided with a nut I^3, which can be tightened up against the junk-ring I′ to prevent loosening of the plug through vibration or jarring.

In some cases, in order to reduce the weight of the packing-tightening device, we reduce the dimensions of the segments of the bush in a circumferential direction, as shown in Fig. 7, wherein four narrow segments are shown in the piston of an engine, the segments being held in their places by pins A*; but the number of such segments used may obviously be varied to suit requirements.

As will be obvious, the arrangements shown in Figs. 5, 6, and 7 can be variously modified. Thus the spring F, instead of acting at one end against the junk-ring I, may act against the piston, as shown in Fig. 8, the position of the inner end of each spring recess being then reversed in position from that shown in Figs. 5 and 6. Instead of using spiral springs F, as shown in these figures, volute or other springs may be used; also, instead of using several of such springs for each bush A or the segments comprising such bush a single spring F* may be used, as shown in Fig. 9, made either of the volute form shown or of other form and arranged to surround the boss or central portion of the piston and located within an annular groove or recess in the bush or bush-segments. When the bushes A and B for a piston are each made in one piece, they may be constructed of sheet metal corrugated, as shown in Fig. 10, so that in the case of bush B, which is split, it will be rendered sufficiently flexible for the purpose in view.

Instead of using several inner metal packing-rings C, as shown in Figs. 5, 6, 8, and 9, a single split metal ring may be used, as shown in Fig. 10, this ring taking the place of the bush B^2, hereinbefore referred to.

Figs. 11 and 12 are vertical sections showing part of a stuffing-box with bushes A and B or bush-segments made of thin corrugated sheet metal instead of the much thicker material shown in Fig. 1, Fig. 11 showing the sheet-metal bush B or bush-segments abutting against the flat inner end of the stuffing-box, and Fig. 12 showing it or them abutting against the inclined surface of a ring or washer K at the inner end of the stuffing-box.

In some cases where the pressure of the packing is inward, especially in cases where fibrous or asbestos packing is used, two or more adjustable screws may be screwed radially through the stuffing-box and caused to abut against the segments of the outer bush to force the same inward when required, as indicated at J* in dotted lines in Fig. 13, which shows a stuffing-box of the same type as Figs. 1 and 2. Such an arrangement may also advantageously be applied to a stuffing-box or stern-pipe for a screw-propeller shaft, as shown in Fig. 14, where J* J* are the radial adjusting-screws, so as to enable such pipe to be tightened and repacked while under water. For this purpose the adjusting-screws J* are screwed up against the segments of the outer bush A, which, acting through the segments of the inner bush B and flexible bush B^2, press the packing C tightly against the screw-propeller shaft. The stuffing-box gland can then be slacked back and fresh packing inserted. The gland is then screwed up, the adjusting-screws being at the same time slacked back, whereby the fresh packing is forced into the stuffing-box. Should more packing be necessary, the operation is repeated as often as required. This arrangement may also be applied to other packing arrangements, such as pump and other stuffing-boxes which it may be required to pack without stopping the engines or while under water.

What we claim is—

1. In a packing device for rods, pistons and the like, an automatic tightening device comprising a pair of bushes A, B, of which the one next the packing is contractible diametrically, the adjacent surfaces of said bushes being formed with curved interlocking corrugations and means adapted to cause one of said bushes to move longitudinally so as to wedge the other toward the packing, substantially as shown and described.

2. In a packing device for rods, pistons and the like, an automatic tightening device comprising a pair of bushes A B of which the one next the packing is made in segments, the adjacent surfaces of said bushes being formed with uniformly rounded teeth or corrugations and a spring or springs adapted to cause one of said bushes to move endwise so as to wedge the other toward said packing substantially as described.

3. In a packing device for rods, pistons and the like, the combination with the packing proper, of an automatic tightening device comprising a pair of bushes A B of which the one next the packing is made in segments, said bushes having their adjacent surfaces formed with uniformly rounded teeth or corrugations, a flexible split tube or bush arranged between one of said bushes and said packing, and a spring or springs adapted to

cause one of said bushes to move endwise so as to wedge the other against said flexible bush and packing substantially as described.

4. The combination in an arrangement for automatically tightening packing, of a number of segments A B arranged in pairs and having their adjacent surfaces formed with uniformly rounded teeth or corrugations, a spring or springs for forcing one of the segments of each pair in an endwise direction so as to wedge the other segment of the pair toward said packing, and means for compressing said spring or springs after being placed in position substantially as described.

5. The combination with a stuffing box containing packing, of a tightening device comprising two or more parts arranged to bear against each other after the manner of wedges and to act against said packing, means adapted to automatically move one or some of said parts relatively to the other and thereby cause pressure to be exerted against said packing, and packing material arranged between the interior of said stuffing box and the part or parts of the tightening device in proximity thereto substantially as herein described.

6. The combination with a stuffing box, of a tightening device adapted to surround packing in said box, and comprising the concentrically arranged bushes A B, having their adjacent surfaces formed with rounded teeth or corrugations, and the inner of which is divided longitudinally into segments, a gland arranged to bear against one of said bushes, and a spring or springs arranged to constantly force said glands toward the bush against which it bears substantially as herein described.

7. The combination with a stuffing box, of a tightening device comprising concentrically arranged bushes having their adjacent surfaces ribbed or corrugated and the inner of which is divided longitudinally and provided at its outer end with an inwardly projecting flange adapted to confine the packing in place, and means acting to constantly force the outer bush in an endwise direction and against the inner one substantially as herein described.

8. The combination with a stuffing box containing packing, of a tightening device surrounding said packing and comprising concentrically arranged bushes having their adjacent surfaces ribbed or corrugated, a gland arranged to bear against one of said bushes, and against packing material located between the rod or other body to be packed and the outer end of the bush against which the gland bears, and a spring or springs acting to constantly force said gland against said bush and packing substantially as herein described.

9. The combination in an arrangement for automatically tightening packing, of a pair of bushes A B having their adjacent surfaces ribbed or corrugated, and each divided longitudinally into segments, a spring or springs for causing one of the divided bushes to move endwise in relation to the other so as to wedge the latter toward said packing, and radial adjusting screws arranged to act laterally against the segments of the outer bush and co-operate in such wedging action substantially as described.

10. In an arrangement for automatically tightening packing the combination with packing C, of the pair of bushes A B having their adjacent surfaces formed with uniformly rounded teeth or corrugations as shown and each divided into segments, a spring or springs for forcing one bush endwise in relation to the other and a flexible bush B^2 arranged between the other bush and the packing substantially as described.

11. The combination in an arrangement for automatically tightening packing of a stuffing box to contain packing, a pair of bushes A B, located in such box, having their adjacent surfaces corrugated, and each formed in segments, a flexible bush B^2 arranged between the bush B and the packing, a gland I adapted to bear against one of said bushes, springs acting to force said gland into said stuffing box and surrounding screw bolts carried by said stuffing box, nuts H screwed on said bolts and serving to tighten said springs, and packing arranged between the outer bush A and the interior of said stuffing box substantially as described.

12. The combination in an arrangement for automatically tightening packing, of a stuffing box and packing located therein, a pair of bushes A B, formed in segments and having their adjacent surfaces corrugated a flexible bush B^2 arranged between said packing and one of said bushes B, packing J compressed between the other bush and said gland, bolts G carried by said stuffing box extending through said gland and fitted with tightening nuts, and springs F each surrounding one of said bolts and acting to force said gland inward, substantially as described.

13. The combination in an arrangement for automatically tightening packing, of a stuffing box, segments A B arranged to surround the packing and located in said box, a flexible bush B^2 arranged between the packing and the inner bush B, a gland I arranged to bear on one of said bushes, bolts G carried by said box and passing through said gland and fitted with tightening nuts, springs F surrounding said studs and acting to force said gland inward, and adjusting screws J* extending through said stuffing box and acting against the outer of said bushes substantially as herein described for the purpose specified.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY CHARLES PLATTS.
THOMAS LOWTHER.

Witnesses:
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GEORGE ROBERT MARTIN.