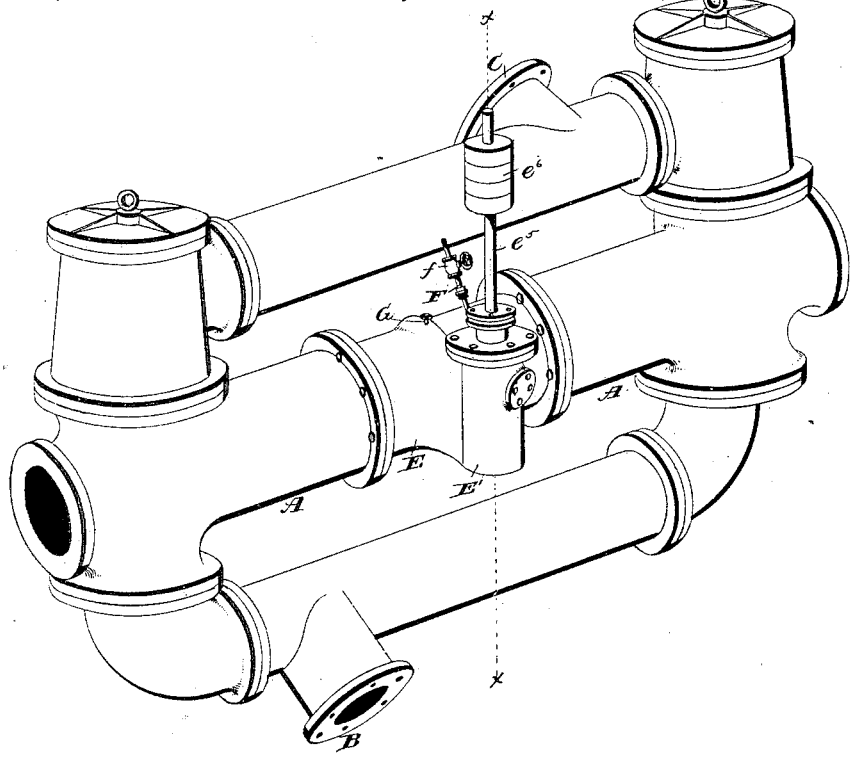
(No Model.) 4 Sheets—Sheet 1.

E. B. COXE.

PACKING FOR PISTONS, PISTON RODS, &c.

No. 419,034. Patented Jan. 7, 1890.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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Fig. 2.

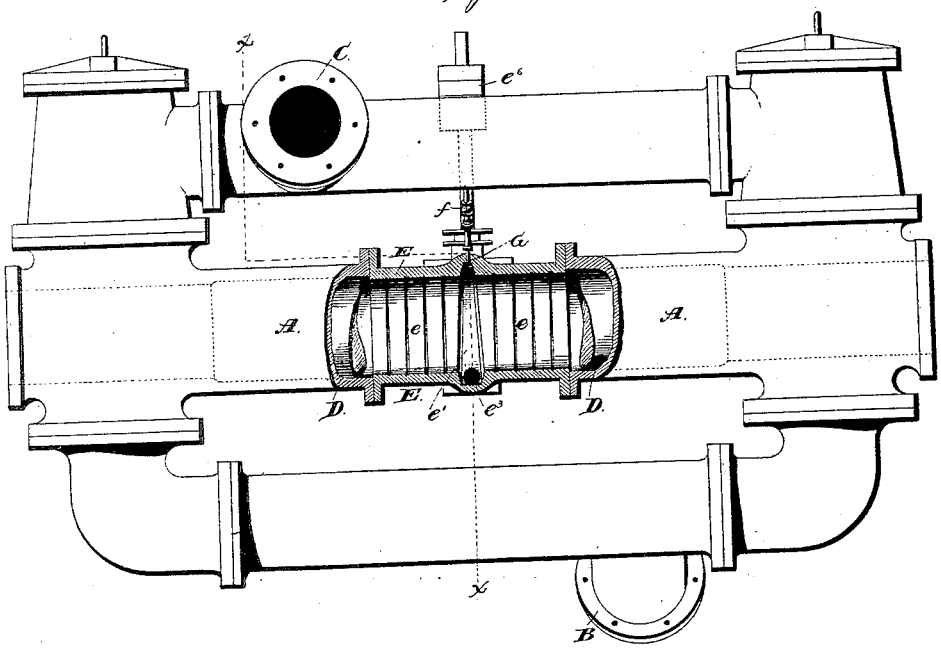
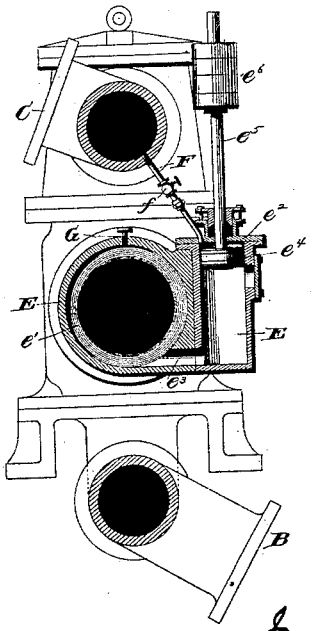


Fig. 5.



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(No Model.) 4 Sheets—Sheet 3.

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Fig. 4.

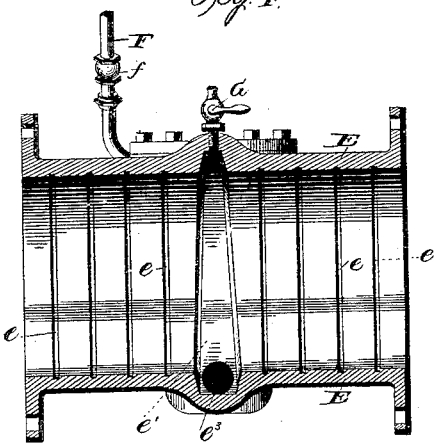


Fig. 5.

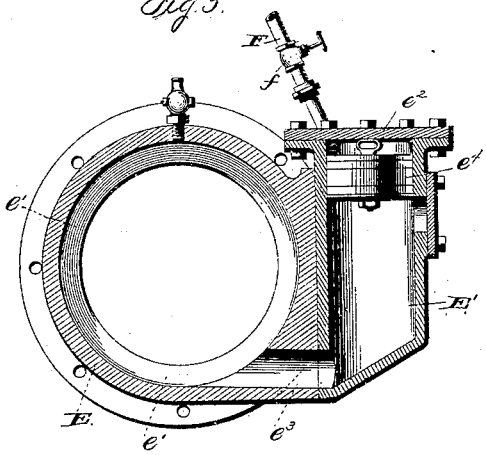


Fig. 6.

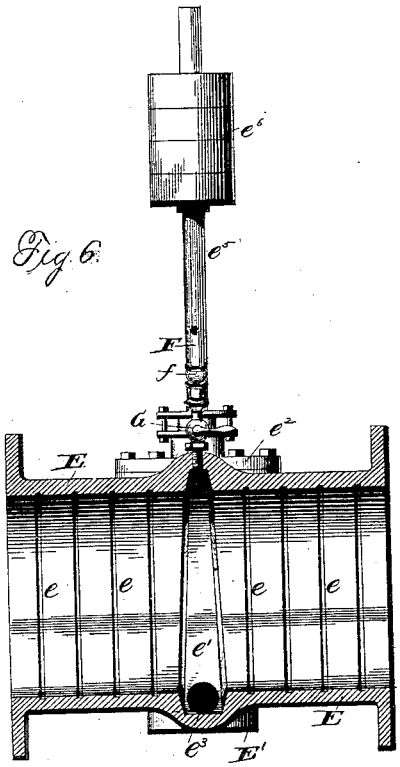
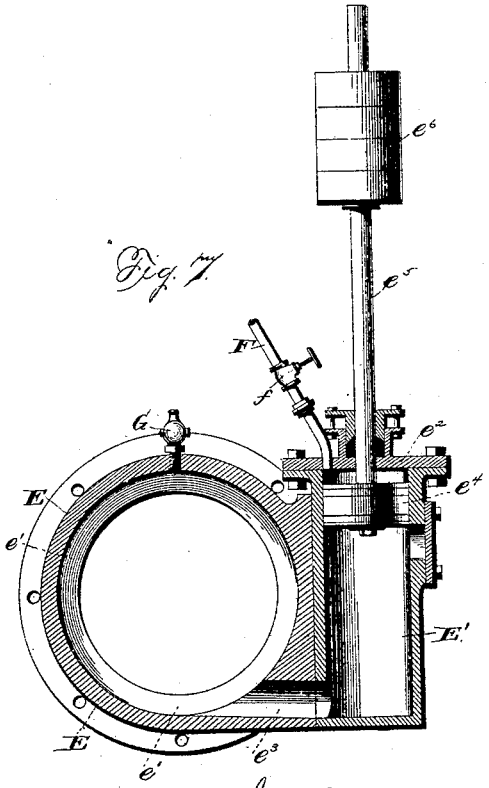


Fig. 7.



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(No Model.) 4 Sheets—Sheet 4.

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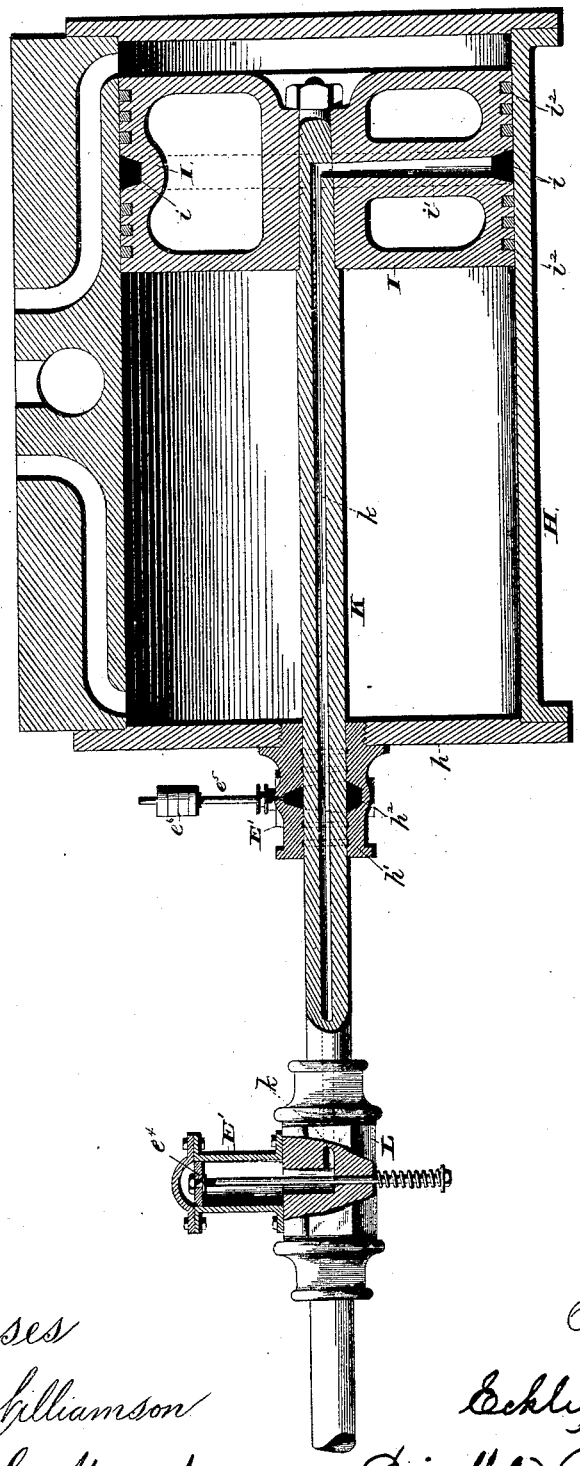

Fig. 8.

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UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA.

PACKING FOR PISTONS, PISTON-RODS, &c.

SPECIFICATION forming part of Letters Patent No. 419,034, dated January 7, 1890.

Application filed October 5, 1888. Serial No. 287,267. (No model.)

To all whom it may concern:

Be it known that I, ECKLEY B. COXE, of Drifton, in the county of Luzerne, and in the State of Pennsylvania, have invented certain new and useful Improvements in Packing for Pistons, Piston-Rods, &c.; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of a double-plunger pump provided with the improved packing. Fig. 2 is a side elevation of the same, showing in longitudinal section the packing-cylinder which connects the water-cylinders. Fig. 3 is a vertical section of the same upon line *x x* of Figs. 1 and 2. Fig. 4 is an enlarged longitudinal section of the packing-cylinder and packing-feeding mechanism when adapted for use of water-pressure for feeding the compressible packing. Fig. 5 is a like view of the same in cross-section. Figs. 6 and 7 are similar views of said packing-cylinder and packing-feeding mechanism when adapted for feeding by means of a weighted piston, and Fig. 8 is a central longitudinal section of a steam-cylinder and piston having the piston and piston-rod packed in accordance with my improved method.

Letters of like name and kind refer to like parts in each of the figures.

In the use of steam-engines, pumps, and other mechanisms in which a rod, plunger, or other longitudinally-movable part works into and out of a compartment under pressure a joint is usually formed by means of hemp, cotton, rubber, asbestus, or other like substances, mixed with a grease or other lubricant, which are compressed by a metal stuffing-box and gland until they closely fill the space around the moving part; but as care and skill are required in the adjustment of the gland it frequently happens that undue friction is caused between the same and the part packed, and an excessive wear between or the cutting together of the metal surfaces results.

In case of pistons moving within a cylinder and requiring to be packed against a pressure, it has heretofore been customary to provide it with peripheral metal rings, which were caused to exert an outward pressure; but in such instance, also, care and skill were necessary to prevent undue pressure between the packing-rings and cylinder, and also to prevent unequal pressure, which would have a tendency to move the piston out of the center of the cylinder, while, under any circumstances, such packing has required to be lubricated, and a failure to supply thereto the necessary amount of lubricant has resulted in a considerable friction, and frequently in the cutting of the bearing-surfaces.

The object of my invention is to enable pistons, rods, pump-plungers, and other like parts, to be packed against pressure, and at the same time insured against injurious friction; and to this end such invention consists in the construction, combination, and arrangement of parts, as hereinafter described and claimed.

While my invention is applicable to every form of mechanism in which a movable part is required to be packed against pressure, it will sufficiently illustrate its principle of operation to show its employment in connection with a rod or plunger and a piston, and for convenience I will show its application to a mine-pump, which, as ordinarily constructed, consists, generally, of two cylinders A and A, that are arranged axially in the same line upon a suitable base or bed, and are each provided with a supply-pipe B, discharge-pipe C, and the usual inlet and outlet valves, which latter are not specifically shown.

Within the cylinders A and A is a plunger D, that substantially fills the inner ends of each, and by any suitable means is adapted to be moved to and fro longitudinally, so as to constitute of each cylinder a single-acting pump. The inner end of each cylinder has heretofore been provided with an ordinary stuffing-box and gland, and between such parts the plunger has worked in the open air; but I connect said cylinders by means of a pipe E, that extends between their inner ends and interiorly corresponds thereto in diameter, so that said plunger may be moved freely through the same without unnecessary space between their contiguous surfaces.

At suitable equidistant points between the ends of the pipe or connecting section E are provided interior circumferential grooves *e* and *e*, which, when the pump is in operation, contain water, that operates to a certain ex-

tent as a packing, while at the longitudinal center of said section is formed a larger groove e', which preferably has a right-angled form in cross-section, with sides that are beveled or flared outward for a certain distance from the inner periphery of said section. Said groove is preferably made considerably wider at its lower side than at its upper side, so that its sides are at an angle to instead of being parallel with each other.

Upon one side, at the longitudinal center of the section E, is formed a vertically-arranged cylinder E′, which at its upper end is inclosed by means of a removable head e^2 and at its lower end communicates with the lowest portion of the groove e' by means of a horizontal passage e^3. Said cylinder is provided with a piston e^4, that is adapted to be moved vertically within the same, and is preferably provided with a rod e^5, which projects upward through a packed opening in said head e^2, and is adapted to receive and support a number of weights e^6. There is also preferably provided a pipe F, that extends between the upper end of said cylinder and the discharge-pipe C, and has a valve f, by means of which water from said discharge-pipe may, if desired, be admitted to said cylinder above its piston.

A cock G, placed within the upper side of the section E and communicating with the upper portion of the groove e', completes the mechanism, the operation of which is as follows, viz: The piston e^4 is raised to the upper end of the cylinder E′, and said cylinder filled with a lubricant, which is preferably composed of tallow, beeswax, and black-lead, and the same combined in such proportions as to render the compound as stiff as it is practicable to force by pressure upon said piston through the passage e^3 into the groove e'. After the cylinder E′ has been filled with the lubricant the cock G is opened and the piston e^4 is caused to descend, either by water-pressure or by weights or force applied to its rod e^5, until said groove has become entirely filled and the lubricant escapes through said cock, after which the latter is closed, said piston raised, and its cylinder again filled, when by the application of the necessary pressure to said piston the lubricant surrounding the pump-plunger D within the groove e' will be caused to fill the space so closely between said plunger and the interior of the section E as to prevent the passage of water from one cylinder A to the other cylinder A. As the plunger D moves to and fro through the encircling ring of lubricant there will be practically no friction at such point, and as at each movement some of said lubricant will adhere to the surface of said plunger, and by it be carried to other points within the packing-section and cylinders, the whole of the bearing-surfaces of said parts will soon become and will remain thoroughly lubricated. The stiffness of the lubricant will usually cause it to so thoroughly close the space around the plunger D as to prevent the passage of water from a cylinder to the packing-groove; but should such not be the case the grooves e and e will arrest the flow. Said grooves will in a like manner prevent the outward passage of the lubricant should the space around the plunger be sufficiently large to permit such flow. It will be seen that the plunger must travel with greater freedom than would be practicable if the old form of packing were employed, and that actual contact between its surface and the surrounding metal becomes substantially impossible. In consequence of the greater surface of the lubricant upon the lower side of said plunger than upon its upper side the upward pressure tends to neutralize the weight of said plunger, and by properly proportioning such upper and lower surfaces the entire weight of the plunger may be balanced so as to cause the latter to be practically suspended.

When the pump is in use, the packing and lubricating mechanism require no other attention than to see that the lubricant-expelling piston is not at the bottom of its cylinder, so that said lubricant is under pressure. The amount of pressure necessary for the lubricant will depend upon the stiffness of the latter and the closeness with which the plunger is fitted, and may be regulated by varying the diameter of the cylinder where the piston is to be moved by water or by the use of more or less weight, if such alone is used; or, if desired, both water-pressure and weights may be employed. Should water-pressure be used and prove too strong, counter-weights may be applied to the piston-rod for the purpose of reducing such pressure. Of course spring-pressure may be employed instead of weights, if desired, and the effective strength of the spring regulated in any usual manner. Should it be deemed more convenient, or if the water to be pumped is acid or muddy, the lubricant-moving piston may be actuated by a piston in another cylinder, in which steam or the foul water may furnish the moving power. By this means the lubricating-packing will be protected and injury to its cylinder and piston prevented.

In Fig. 8 is shown an ordinary steam-cylinder H, containing a piston I and piston-rod K, to which the invention is applied. Said piston is provided with a centrally-located peripheral groove i, that by means of a radial opening i' communicates with an opening k, which extends axially through the rod K to or near the cross-head L, at which latter point said opening k extends upward into a lubricant-holding cylinder E′, that corresponds in construction to the like cylinder heretofore described, and, like the same, has a spring-pressed piston e^4, by means of which its contents are forced into and caused to fill said groove i, when said lubricant operates in precisely the same manner as in case of the pump-plunger. If desired, parallel grooves i^2 and i^2 may be formed within said piston at

each side of said central groove *i*, where they will act to obstruct the flow of steam and to catch any lubricant that might pass outward.

As seen in Fig. 8, the front cylinder-head *h* is provided with a stuffing-box *h'*, that interiorly is provided with a centrally-located circumferential groove h^2, which groove communicates with a lubricant-containing cylinder E', that like those described is provided with a weight or spring-operated piston, by means of which the lubricant is forced into said groove h^2. Other grooves h^3 and h^3 are preferably formed within said stuffing-box at each side of said groove h^2, but may be omitted, if desired.

Having thus described my invention, what I claim is—

1. As a means for packing a joint between and lubricating relatively moving parts, the combination, with a stationary part in which is provided an annular space, of a lubricant receiving and containing reservoir adjoining said stationary part and communicating with the space therein at or near its lower side, from which lubricant may be forced into said space at a uniform pressure, substantially as and for the purpose specified.

2. As a means for packing a joint between and lubricating relatively moving parts, the combination, with one of such parts in which is provided an annular groove whose cross-sectional area is greatest in its lower portion, of means whereby said groove may be filled with a lubricant at its lower side, substantially as and for the purpose shown.

3. As a means for packing a joint between and lubricating relatively moving parts, the combination, with one of such parts in which is provided an annular groove whose cross-sectional area gradually increases from its top to its bottom, at which latter point it is greatest, of a lubricant receiving and containing reservoir from which lubricant may be forced into said groove, substantially as and for the purpose shown.

4. As a means for packing a joint between and lubricating relatively moving parts, the combination, with one of such parts in which is provided an annular groove of uniform depth, but whose width is narrowest at its top, from which point it gradually increases toward its bottom, being widest thereat, of a lubricant receiving and containing reservoir from which lubricant may be forced into said groove, substantially as and for the purpose set forth.

5. As a means for packing joints between and lubricating relatively moving parts, the combination, with a stationary part in which is provided an annular space, of a lubricant receiving and containing reservoir arranged adjacent to said stationary part and having near its lower end a passage communicating with said groove near the lower portion thereof, substantially as and for the purpose shown.

6. As an improvement in packing and lubricating plunger-pumps, the combination, with the plunger and the cylinders thereof, of a pipe connecting said cylinders and provided interiorly with an annular lubricant-receiving space and a lubricant receiving and containing reservoir from which lubricant may be forced into said space, substantially as and for the purpose set forth.

7. As an improvement in packing and lubricating plunger-pumps, the combination, with the plunger and the cylinders thereof, of a pipe connecting said cylinders and provided interiorly with an annular space, a lubricant receiving and containing reservoir from which lubricant may be forced into said space, and a pipe connecting said reservoir with the discharge-pipe of the pump, substantially as and for the purpose shown.

In testimony that I claim the foregoing I have hereunto set my hand this 25th day of September, 1888.

ECKLEY B. COXE.

Witnesses:
ELLIOTT A. OBERRENDER,
HARRY J. DAVIS.