(No Model.) 2 Sheets—Sheet 1.

E. N. WALLIS.

MEANS FOR INCREASING ADHESION OF BELTS AND PULLEYS.

No. 566,637. Patented Aug. 25, 1896.

FIG. 1.

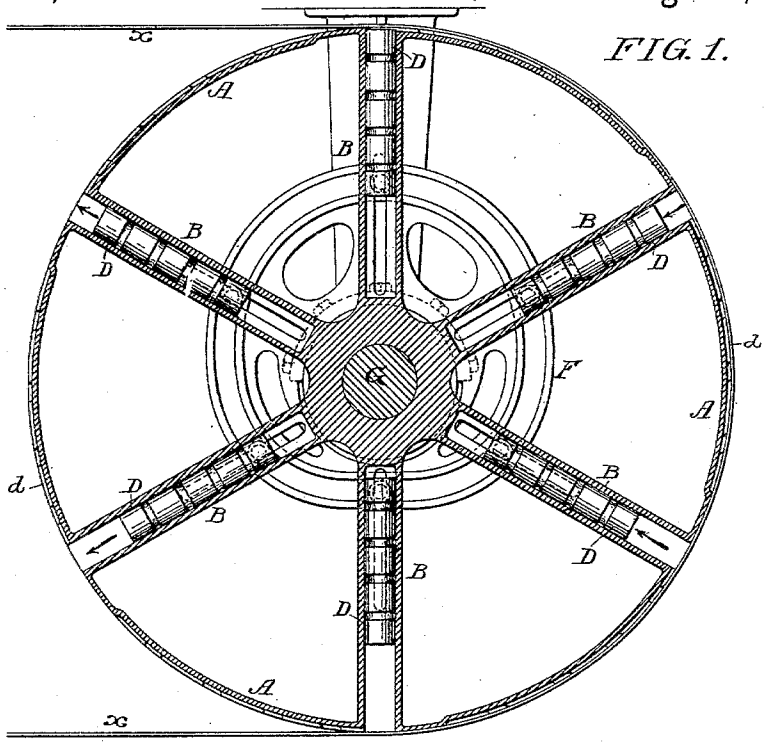


FIG. 2.

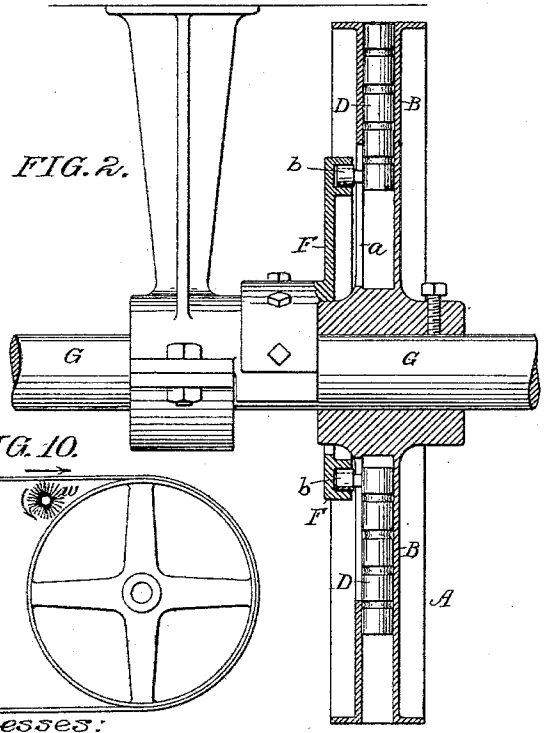
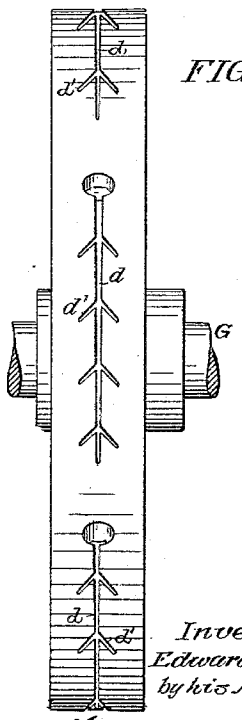


FIG. 10.

FIG. 3.



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by his Attorneys
Howson & Howson

(No Model.) 2 Sheets—Sheet 2.

E. N. WALLIS.

MEANS FOR INCREASING ADHESION OF BELTS AND PULLEYS.

No. 566,637. Patented Aug. 25, 1896.

FIG. 4.

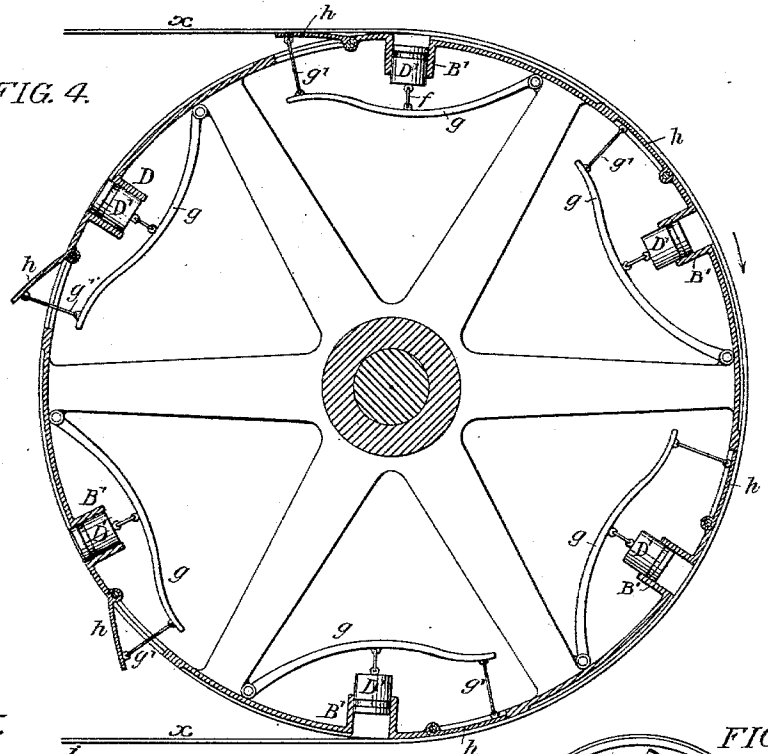


FIG. 5.

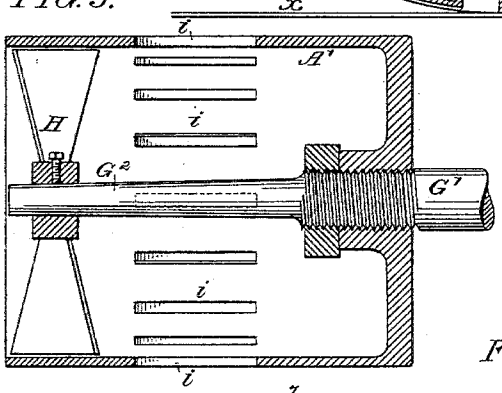


FIG. 7.

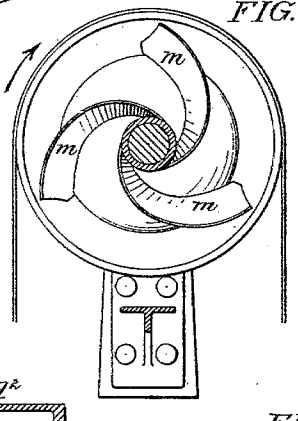
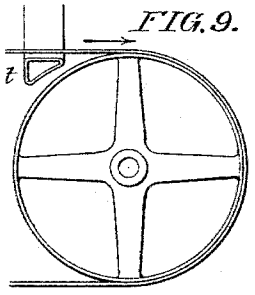


FIG. 6.

FIG. 9.



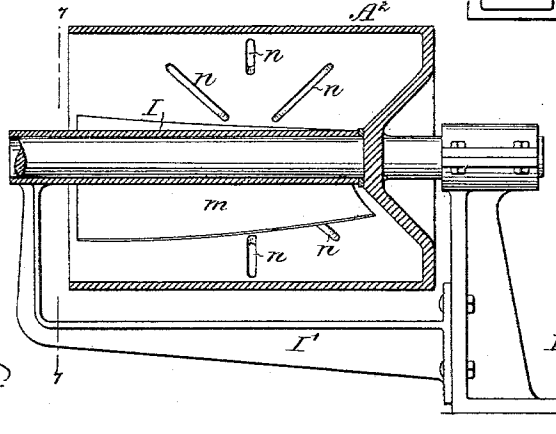
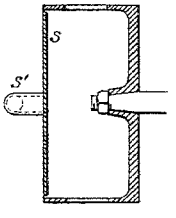


FIG. 8.



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by his Attorney.
Howson & Howson

UNITED STATES PATENT OFFICE.

EDWARD N. WALLIS, OF PHILADELPHIA, PENNSYLVANIA.

MEANS FOR INCREASING ADHESION OF BELTS AND PULLEYS.

SPECIFICATION forming part of Letters Patent No. 566,637, dated August 25, 1896.

Application filed December 3, 1895. Serial No. 570,931. (No model.)

To all whom it may concern:

Be it known that I, EDWARD N. WALLIS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Means for Increasing the Adhesion of Belts and Pulleys, of which the following is a specification.

The object of my invention is to cause a driving-belt to adhere more firmly than usual to the surface of the driving or driven pulley with which it is in contact. This object I attain by withdrawing the air from the inner side of the belt, either before or after the latter comes into contact with the rim of the pulley.

In the accompanying drawings, Figure 1 is longitudinal section of a belt-pulley provided with means in accordance with my invention for increasing the adhesion of the belt. Fig. 2 is a transverse section, partly in elevation. Fig. 3 is a side view of the pulley. Fig. 4 is a longitudinal section illustrating a modified form of pulley embodying my invention. Figs. 5 and 6 are longitudinal sections of another form of pulley, illustrating still further modifications of the invention. Fig. 7 is a transverse section on the line 7 7, Fig. 6; and Figs. 8, 9, and 10 are views on a reduced scale and illustrating other means of carrying out my invention.

One primary cause of the slipping of belts on pulleys I conceive to be due to the formation of a cushion between the belt and pulley by air carried forward by the inner side of the rapidly-moving belt and trapped between the belt and the rim of the pulley. In carrying out my invention, therefore, I use means for withdrawing this air and thus preventing the formation of the objectionable cushion between the pulley and the belt.

In the pulley shown in Figs. 1, 2, and 3, A represents the rim of the pulley, and B the spokes of the same, the latter being hollow and open at their outer ends, so as to form cylinders for the reception of a series of plungers or pistons D, the latter fitting in the hollow spokes with comparative snugness, but so that they can be moved to and fro therein without much friction, whereby each of the hollow spokes and its contained plunger or piston constitutes a pump whereby air may be drawn into the hollow spoke from the outer end of the same on the inward movement of the piston or expelled from the spoke on the outward movement of the same. Each of the spokes B has in one side of the same a slot *a*, through which passes a lug or projection on the piston or plunger contained within said hollow spoke, this lug having at the outer end an antifriction-roller *b*, which is engaged by a cam F, suitably mounted upon the hanger for the shaft G or upon some other available fixed support. As the pulley rotates, therefore, the pistons or plungers in the hollow spokes will be caused to reciprocate therein, the cam F being so formed that said pistons will be drawn inward during that half of the rotation of the pulley when the belt is in contact with the rim of the same and will be pushed outward during that half of the rotation of the pulley when the belt is free from contact with the rim of the same, as will be understood upon reference to the arrows in Fig. 1. By this means a partial vacuum is created in each spoke during the time that the outer end of the same is closed by the belt *x*. Hence the maintenance of an air-cushion between the belt and pulley is effectually prevented and said belt is drawn down firmly into contact with the rim of the pulley.

In order to increase the area of the belt which is under the influence of the partial vacuum created in the hollow spokes of the pulley, grooves or channels *d*, with wings or branches *d'* extending therefrom, may be formed in the rim of the pulley, as shown in Fig. 3, each of these grooves or channels communicating with one of the hollow spokes. While I prefer to utilize the spokes of the wheel in order to form pump-cylinders in the manner described, it will be evident that these cylinders may be independent of the spokes, if desired.

In Fig. 4 I have illustrated a construction in which the pump-cylinders are independent of the spokes and also a modified plan of operating the pistons or plungers in said pump-cylinders. In this case the pump-cylinders are in the form of short tubes B', projecting inwardly from the rim of the wheel and having short plungers D', which are connected by links *f* to arms *g*, hung to suitable bearings on the spokes or rim of the wheel and connected at their outer ends by means of

links g' to plates h, forming pivoted sections of the wheel-rim. When the pulley is rotated in the direction of the arrow, Fig. 4, therefore, these pivoted sections of the wheel-rim follow the pump-cylinders D', and such of said pivoted sections h as are free from the restraining influence of the driving-belt x will be thrown outward by centrifugal force, so as to project their respective plungers in the cylinders. If desired, centrifugal action may be aided by the resilience of the arms g in order to project the pivot-sections of the rim when the latter are free from the restraining influence of the belt, the arms in such case being rigidly mounted upon the pulley. As soon as one of the pivot-sections of the rim comes into contact with the driving-belt it is depressed thereby, so as to be flush with the rim, and hence causes an inward movement of the plunger in the pump-cylinder in advance of the same, so as to create in said cylinder the desired partial vacuum for drawing the belt into firmer contact with the rim of the pulley. As soon as each pump-cylinder reaches a position where its outer end begins to be uncovered the partial vacuum in said cylinder is destroyed, and hence the belt can freely leave the pulley-rim, the further forward movement of the pulley freeing the pivot-section of the same and permitting the projection of the plunger in the cylinder preparatory to another inward movement of the same when the pivot-section again strikes the belt.

My invention can also be carried out without the employment of the cylinder and piston as a means of creating a partial vacuum, a rotary fan or exhaust device being available as well for this purpose in many cases. Thus in Fig. 5 I have shown a form of belt-pulley which is closed at one end but open at the other end, and in the open end of the pulley is located an exhaust-fan H, of any ordinary construction, the hub of this fan being secured to a projecting portion G^2 of the pulley-shaft G'. When the pulley is rotated, therefore, the exhaust-fan H is likewise rotated and causes a partial vacuum in the interior of the pulley, so as to cause an inflow of air through perforations or slots i, formed in the rim of the pulley. These slots are so proportioned that those which are uncovered by the belt will not be sufficient in area to supply the volume of air required by the draft of the fan. Hence there will always be maintained in the interior of the pulley a partial vacuum, which will exert its influence through the slots covered by the belt to draw said belt more firmly than usual into contact with the rim of the pulley.

In Figs. 6 and 7 I have illustrated a modification of this idea, in which, in place of the rotating exhaust-fan, I employ a fixed sleeve I, mounted upon a fixed arm or bracket I', so as to be supported in a position concentric with the axis of rotation of the pulley, this sleeve having outwardly-flaring and spirally-curved blades or vanes m, which extend outwardly to points close to the inner rim of the pulley, as shown in Fig. 7. As the pulley is rotated in the direction of the arrow, the air within the same partakes of this rotating movement and is thus brought into contact with the blades or vanes m, whereby it is thrown outward and discharged from the opening of the pulley A^2, so as to create a partial vacuum therein, the rim of the pulley being provided with slots n, which perform the same function as the slots i of the pulley A'. (Shown in Fig. 5.)

In all of the constructions thus far described the operation of the air-exhausting devices is dependent upon the rotation of the pulley; but the exhausting of the air may be effected by means independent of the pulley itself, if desired. For instance, in Fig. 8 I have shown a construction of pulley similar to that of Fig. 5, but having its outer end closed by a plate s, the outer edge of which does not, however, come into actual contact with the inner face of the pulley-rim. This plate has a central pipe s', which may be in communication with any conveniently-located exhaust apparatus, so as to continually maintain a partial vacuum in the pulley when the latter is in operation. Neither is it absolutely necessary to my invention that the air shall be withdrawn from between the belt and the pulley-rim, as it may be withdrawn from the inner face of the belt just before the latter reaches the rim of the pulley by an exhaust-pipe such as shown at t, Fig. 9, or the air may be withdrawn by other means than exhaust mechanism, a brush w, such as shown in Fig. 10, rotating in contact with or in close proximity to the inner face of the belt and in a direction the reverse of the direction of movement of the latter, being in some cases available for preventing the cushioning action between the belt and pulley.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination of a belt and pulley with means for positively withdrawing air from the inner face of the belt, and thereby preventing the formation of an air-cushion between the belt and pulley.

2. The combination of a belt and pulley with air-exhausting mechanism for withdrawing air from the inner face of the belt.

3. The combination of a belt-pulley having openings in the rim of the same, with means for exhausting or partially exhausting the air from said openings when they are covered by the belt.

4. The combination of a belt-pulley having openings in the rim of the same, with air-exhausting devices communicating with said openings and depending for their operation upon the rotation of the pulley.

5. A belt-pulley having in the rim of the same openings communicating with pump-cylinders, pistons in said cylinders, and

means for effecting the reciprocation of said pistons as the pulley rotates.

6. A belt-pulley having openings in the rim of the same, pump-cylinders communicating with said openings, pistons in said cylinders, and a fixed cam, whereby, as the pulley rotates, said pistons are caused to reciprocate in the cylinders.

7. A pulley having openings in the rim of the same, hollow spokes communicating with said openings and constituting pump-cylinders, pistons contained in said hollow spokes, and a fixed cam, whereby, on the rotation of the pulley, said pistons are caused to reciprocate in the hollow spokes.

8. The combination of a belt-pulley having openings extending through the rim of the same and communicating with channels or passages formed in the outer surface of said rim, with means for exhausting the air from said openings, and the channels communicating therewith, when said openings and channels are covered by the belt.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD N. WALLIS.

Witnesses:
FRANK E. BECHTOLD,
JOS. H. KLEIN.