BILL'S METALLIC PISTON-PACKING.

This invention is intended to be applied to pistons that are packed with metallic rings, and it is designed to expand the rings equally all around, by means of two levers which are placed on the central hub of the piston, and that operate on a ring that is placed into the packing rings, and which is cut open on one side, so that levers pressing on the opposite side of this cut expand the ring equally; and, by the action of this ring, the packing rings are expanded equally, too. The levers are operated by a cam, to which a ratchet-wheel is attached, so that the ring may be gradually expanded without opening the piston. Fig. 1 is a horizontal section of the invention, and Fig. 2 is a vertical one.

Fig. 1

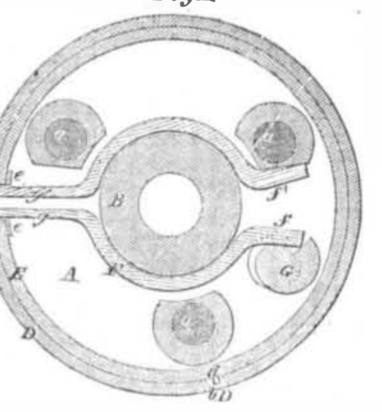
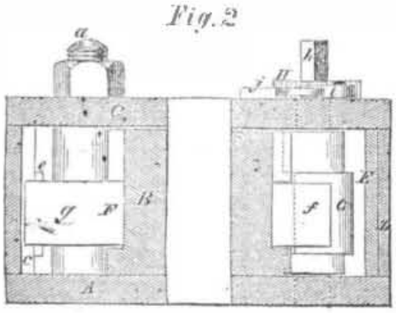


Fig. 2



A is the head of a piston to which the hub, B, is attached, and the follower, C, is secured on it by means of screws, *a*, in the usual manner. The packing consists of two metallic rings, D, which are cut open on one side, as seen at *b* (Fig. 1), so that they allow of an expansion, these cuts being made oblique and placed on opposite sides of the piston, as is usually done in order to prevent the escape of the steam and an unequal wear of the cylinder. A ring, E, is placed into the other rings, D, which is of the same width as the two former put together, and which fits closely into them, and a gap, C, is made into this ring in a vertical direction, and two pins, *d*, are fastened in its outer surface, which extend through the cuts, *b*, in the rings, D. Two levers, F, are placed over the central hub, B, which serves for their fulcrum, and these levers have two arms each, which extend on opposite sides from the hub. The arm, *f′*, of the lever presses against the socket of one the screws, *a*, with which the follower is attached, and its other arm, *g′*, extends to the gap, *c*, in the ring, E. The arm, *g*, of the lever extends also into this gap, so that these two arms, *g*, *g′*, press on the opposite edges, which are strengthened by plates, *e*, *e*, and the other arm, *f*, of the lever is operated on by means of a cam, G, the stem, *h*, of which extends up through the follower and terminates in a square part, so that it can easily be turned with a wrench or key fitted to it. A ratchet-wheel, H, is fastened on the stem, *h*, of the cam, and a pawl, *i*, which is pressed against the ratchet-wheel by a spring, *j*, allows of turning the same in one direction only, and it serves to arrest the cam in any position into which it may have been brought. The shape of this cam is such that, by turning the same, the arm, *g*, is pressed in more and more.

The operation is as follows:—The piston is placed into the cylinder before the rings are expanded, in which state it can easily be entered, and after it has been adjusted and properly fastened to the engine, the cam, G, is turned so as to act on the levers, *f*. By pressing in the arm, *g*, the arm, *f*, is forced out so that it acts on the edge of the gap, *c*, in the ring, E: and as this ring is prevented from slipping by the arm, *f′*, of the levers which presses on the opposite edge of the gap, *c*, it is expanded by the action of the cam equally all round, and as it fits closely into the rings, D, these latter will be brought up tightly against the sides of the cylinder; and in case of any wear, the smallest turn of the cam, G, will bring up the rings again, and the piston may thus easily be kept tight, and as the expansion is equal all round, the cylinder will always wear round, and no new boring-out will be required.

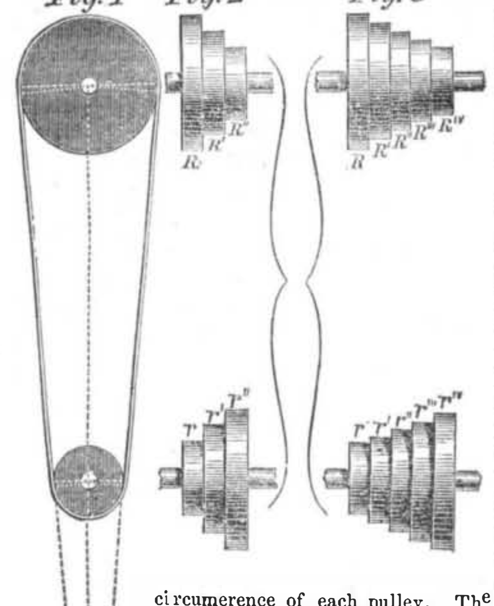
The inventor is Asa G. Bill, of Cuyahoga Falls, Ohio, and the patent is dated April 5, 1859. Any further information can be obtained by addressing the inventor, as above.

CONSTRUCTION OF CONE PULLIES.

The principal difficulty with cone pulleys is to construct them so that the belt is properly stretched when shifted from one speed to the other. The fault with most cone pulleys is, that the belt is perfectly tight on the quickest and slowest speed, and slack on the others; and the reason for this is that these pulleys are generally constructed independent of the distance from each other at which they are intended to work. If this distance is very great, compared with the diameter of the pulleys, it may be neglected; but at such distances where cone pulleys are generally used, a fault arises from this neglect, which causes all the difficulty. Suppose two pulleys—R and r, in Fig. 1—to be at a distance of 10 feet, the radius of the pulley, R, being 12 inches, and of the pulley, r, 6 inches; and it will be seen by referring to this figure, that the belt running over these pulleys embraces more than one-half of the larger and less than one-half of the smaller pulley. The difference between one-half of the circumference and between the arc encircled by the belt on both pulleys is measured by the angle obtained by prolonging the sides of the belt, until they intersect at a point, *a*, beyond the smaller pulley, r, and this angle has to be added to half the circumference of the larger pulley and substracted from that of the smaller pulley, in order to find the arc embraced by the belt.

If the two pulleys are at such a distance one from the other, that the angle made by the prolonged sides of the belt can be neglected, or if the two pulleys are of equal diameter, the length of the belt is found by adding to the double distance of the two pulleys one-half of the

Fig. 1 *Fig. 2* *Fig. 3*



circumerence of each pulley. The larger this angle, the longer must be the belt in proportion to the distance of the two pulleys.

Example 1. If the pulley, R, has a radius of 12 inches, the pulley, r, a radius of 6 inches, and the distance of the centers of the two pulleys be 10 feet, the length of the belt is 24·7384 feet, the angle made by the sides of thebelt being 2° 52′. If this angle is neglected, the length of the belt would be only 24·71 feet, making a difference of about one-third of an inch. If the pulleys are at 7 feet distance only, the length of the belt is 18·7479 the angle between the sides of the belt being 4° 5′ 46″. With neglecting this angle, the length of the belt is 18·71 feet, making a difference of nearly one-half an inch on a shorter belt.

Example 2. If it is now desired to construct two cone pullies with three speeds, R, R^1, R^3, and r, r^1, r^3, (Fig. 2) giving the first roller, R, a radius of 12 inches, and the corresponding roller, r, of the other cone a radius of 6 inches, the two following speeds, R^1 and r^1, to be of equal diameter, and the speeds R^3 and r^2 being the reverse of the first speed, it is found that, for a distance of 10 feet, the radius of the rollers R^1 and r^1 has to be 9·05 or 9 1-20 inches, or one-tenth of an inch more than is commonly given to these speeds under equal circumstances, in order to keep the belt stretched. If the pulleys are at a distance of 7 feet only, the radius of the speeds R^1 and r^1 is to be 9·0678 or 9 1-14 inches, or their diameter one-seventh of an inch larger than would be commonly given to them. One more example will be sufficient to show the difficulty, but also the practical value of these calculations.

Example 3. It is desired to construct two cone pullies with five speeds—R, R^1, R^2, R^3 and R^4 on one pulley, and r, r_1, r^2, r^3 and r^4 on the other pulley—R having 12 inches radius and r 6 inches; R^1 to be to r^1 as 3 to 2; R^2 to r_2 as 1 to 1; R^3 to r^3 as 2 to 3; and R^4 one-half of r^4. The distance of the centers of the shafts being 10 feet, the length of the belt is found to be 24·7384 feet, when stretched over the two first pulleys. In going to the second pair of pulleys, neither radius is known, and consequently the angle made by the belt and the true length of the belt cannot be found as easy as before. By the aid of higher mathematics, it is found, however, that R^1 must have a radius of 10·83 inches, and r^1 a radius of 7·22, to suit to the same length of belt which is used for the two former speeds. The angle made by the sides of the belt is 1° 43′ 10″, and if this angle is neglected the results become too large, 10·86 being found for the radius of R^1 and 7·24 for the radius of r^1, which would make the belt about one-eighth of an inch longer that it is required for the first pair, R and r. This fault would be larger yet if the pulleys were brought closer together. The radius of the pulleys R^2 and r^2, one being equal to the other, is found to be 9·05 or 9·1-20 inches, as shown in the second example. The radius of R^3 will be equal to r^1; that of r_3 equal to R^1; that of R_4 equal to r; and that of r^4 equal to R; thus making the several speeds of the two cone pulleys, at a distance of 10 feet, as follows:—

R.	R^1.	R_3.	R^3.	R^4.
12	10·83	9·05	7·22	6 inches.
r.	r^1.	r^2.	r^3.	r_4.
6	7·22	9·05	10·83	12 inches.

From the foregoing examples, it will be understood why two cone pulleys have to be made of different diameters for different distances, and it is impossible, therefore, to give a common rule that would enable those not skilled in mathematics to calculate the diameters of the different speeds of the cone pulleys placed at any distance which may be desired.

"STILL THEY COME!"

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Aurora, Ill., July, 1859.

[We are daily receiving complimentary letters like the above from all parts of the country. It gratifies us to know that our labors and the increased expense we are incurring in our New Series are being appreciated in all parts of our land. The public sentiment in approbation of our enlargement and change of form is universal, and our subscription list is now augmenting—thanks to our friends—at the rate of 200 per day!—EDS.

It is reported, in reference to the Hoosac Tunnel, Mass., that Messrs. Haupt & Company have concluded arrangements with a company of wealthy, energetic and experienced contractors, to sink a shaft on the west slope of the Hoosac mountain, two hundred and fifty feet in depth, and drive two thousand two hundred feet of the tunnel. By this means the work will proceed at four faces instead of two, and with an improved organization it is expected that a progress three times as rapid as heretofore will be accomplished. Visitors to the tunnel are now able to walk a quarter of a mile into the mountain at the east side.