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TRACTIVE FORCE OF LEATHER BELTS ON PULLEY FACES.*

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It is of the highest value to users of leather belts to know the exact conditions which give the greatest tractive force of belts on pulley faces; in immediate connection with this, it is essential to have knowledge of what constitutes the best leather belting.

It is the opinion of the writer that the best belts are made from all oak-tanned leather, and curried with the use of cod oil and tallow, all to be of superior quality. Such belts have continued in use thirty or forty years when used as simple driving-belts, driving a proper amount of power, and having had suitable care.

In the best methods of currying, only a very small quantity of the stearine of tallow enters into the leather; the oleine of the tallow and cod oil, during a period of four weeks employed in a suitable currying process, oxidize under the influence of heat, moisture and much hand and machine labor intelligently used, and become, or partake of the nature of a gum or varnish, most intimately united with fibres which interlace in all directions.

Such leather contains no free oil, which would, if of animal or vegetable origin, have a natural tendency to generate free acid injurious to the fibres. Belt leather thus made has a supple character, with a little elasticity and compressibility which eminently fits it for tractive use on a pulley face.

When a new belt is put to use with the flesh side to the pulley, there is on it a certain quantity of stearine from the tallow (rubbed down to give smoothness to that side); this grease acts, or aids, by increasing the surface of contact, to give an extra tractive quality to the leather. If the grain side is run to the pulley face, then, in the first use of the belt, there is more tendency to slip, owing to the absence of grease on the surface, and also to the fact that the grain is hard; and in case of small diameters of pulleys, the belt face is wrinkled, thus it is less in a condition to be brought into intimate contact, under pressure, with the pulley face over its whole contact surface, than is the softer flesh side. The stearine on the surface of the flesh side, and the softness of its face, operate to exclude air from between the two surfaces, thus affording the benefit of atmospheric pressure, the strongest element in its tractive force, to hold the belt to the pulley face. In addition, when the two surfaces of leather and iron come together, on one or both of which there is a semi-fluid to interpenetrate into the pores of the two faces (providing there is a minimum of this material, or only sufficient for this interpenetration) then this material becomes an impediment to the slipping of the belt to the extent of the cohesion to, or affinity for, the iron and leather.

This statement, in relation to the action of stearine on the flesh side of leather, and the running of that side to a pulley face, is not given in the sense of an approval of either the one or the other, but to illustrate by a familiar fact. Stearine has no legitimate place on, or in, leather; also the flesh side should not be run to the pulley face, for the reason that the wear from contact with the pulley should come on the grain side, as that surface of the belt is much weaker in its tensile strength than the flesh side; also as the grain is hard it is more enduring for the wear of attrition; further, if the grain is actually worn off, then the belt may not suffer, in its integrity, from a ready tendency of the hard grain side to crack.

The most intimate contact of a belt with a pulley comes, first, in the smoothness of a pulley face, including freedom from ridges and hollows left by turning tools. Second: In the smoothness of the surface and evenness in the texture, or body, of a belt. Third: In having the crown of the driving and receiving pulleys exactly alike; as nearly so as is practicable, in a commercial sense. Fourth: In having the crown of pulleys not over $\frac{1}{8}$" for a 24" face, that is to say, that the pulley is not to be over $\frac{1}{4}$" larger in diameter in its centre. Fifth: In having the crown other than two planes meeting at the centre. Sixth: The use of any material on, or in, a belt, in addition to those necessarily used in the currying process, to keep them pliable or increase their tractive quality, should wholly depend upon the exigencies arising in the use of belts; and the use of such material may justly be governed by this idea, that it is safer to sin in non-use than in over-use. Seventh: With reference to the lacing of belts, it seems to be a good practice to cut the ends to a convex shape by using a former, so that there may be a nearly uniform stress on the lacing through the centre as compared with the edges. For a belt 10" wide, the centre of each should recede 1·10".

An impediment to the just use of leather belting, in minor cases, comes from the fact that many manufacturers of machin-

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