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UNITED STATES PATENT OFFICE.

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PREPARATION OF STEEL WOOL.

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To all whom it may concern:

Be it known that I, LAWRENCE STERN, a citizen of the United States, residing at 229 West 105th Street, New York city, have invented the following described Improvements in the Preparation of Steel Wool.

The invention relates to the manufacture of steel wool, which, as is well known, is an abrasive material consisting of long, curly, filamentary steel shavings, which become loosely and irregularly matted in the course of production and handling so as to form a mass or assemblage of tangled bunches of irregular shapes and widely varying sizes.

Each individual bunch can be separated from the others fairly easily by pulling it away and rupturing the relatively few strands that connect it to the others, but cannot itself be divided or torn asunder except by greater effort. Such material is usually put on the market either in this condition or compressed into strong containers. By compression the material may be compacted, but the elasticity of the metal is so superior to the interlocking of the tangled strands which results from compression alone, that the mass expands very considerably when the pressure is relieved, as by opening the package, and compression alone therefore is not effective for permanently compacting it, nor does compression serve to weld together or consolidate the individual bunches so as to constitute them as a single, or, so to speak, one-piece bunch. In consequence, as this material is usually found on the market, it exhibits more or less definite lines and sub-lines demarking the separate bunches and along which the mass or assemblage of tangled strands tears and separates irregularly as the material is used, so that when the individual bunches happen to be small the user is constantly inconvenienced by having to gather and hold them together and continuously rearrange the separating bunches in his hand; and in the case of the larger bunches is put to the trouble of tearing them apart.

This invention concerns the treatment of the material so as to make any given mass of it more uniformly tenacious, that is to say, less subject to disintegration of separation into smaller pieces or bunches in the course of use, and consists in rolling each mass by relatively moving surfaces. This produces a more thorough interlocking of the filaments than can be obtained in any other way so far as I am aware, and permanently compacts the material. More especially the invention provides an effective and inexpensive means of producing flat ended cylinders ready for immediate use and of such a size as may be conveniently held in the fingers, and having the advantage that, the wool can thus be easily prepared for packing for sale, and the further advantage, since the rolled up masses are not subject to easy disintegration, that the small units wear longer.

In the accompanying drawing, Figure 1 is a perspective of a cylindrical mass of steel wool as produced by rolling a quantity of the loosely entangled strands in accordance with my invention; Figure 2 is an elevation partly in section of a machine for rolling such masses; Figure 3 is a plan of the same machine partly in section; Figure 4 is a section on line IV—IV of Figure 2; Figure 5 is an elevation of a modification of Figure 2, and Figure 6 is a section on line IV—IV of Figure 5.

For rolling the material, surfaces are arranged to move relatively to each other so as to roll up a sufficient quantity of the loosely matted wool to form the unit desired. Preferably the relative movement between the surfaces is unidirectional so that the wool passes through the machine from a point of entrance to another point of exit, the length of the pass being sufficient to roll each mass of the particular quality of material in hand until the demarkation between the bunches substantially disappear. For example, as shown in Figures 2, 3 and 4, such a machine may consist essentially of two flexible leather belts 1 and 2 of the same width spaced one above the other and driven in the same direction (as indicated by arrows in Fig. 1) but at different speeds. A frame 3 carries pulleys 4 and 5 for supporting the belts respectively and the belt 1 is driven by the power pulley 6 fixed to the shaft of the pulley 4 at the left of the machine; in turn the belt 1 drives the belt 2 through the belt or chain connection 7 which is driven by a driving pulley 8 fixed on the shaft of the pulley 4 at the right of the machine and drives a larger pulley 9 fixed to the shaft of the pulley 5 at the left, the
different sizes of the pulleys 8 and 9 causing the belt 2 to move somewhat slower than the belt 1. Thus the adjacent courses of the belts 1 and 2, between which the rolls are formed, travel in opposite directions and the lower course, that is to say, the rolling surface provided by the belt 1 travels at a higher speed than the co-operating or upper rolling surface. Opposing side walls or forming members 13 and 14 at the edges of the rolling belts 1 and 2 complete a rolling space or pass of rectangular cross section through which the wool travels, confining the wool between the belts and making the product uniform. These side walls may be of smooth metal over which the wool will slide easily. A smooth-surfaced flexible shield 15, for example of sheet metal, over which the wool will also slide easily, may be extended around the pulley 5 and belt at the entrance end of the machine and somewhat into the end of the roll pass to assist in the introduction of the wool into the pass by preventing contact of the wool with the outwardly moving belt 2 until the wool is well within the pass. This shield is preferably sloped downwardly toward the entrance of the pass, as shown, to co-operate with the divergent ends 19 of the side walls 13 and 14 and the extension of the lower belt beyond the other at this end of the machine, all of which further assist in the introduction of the wool into the pass. Backing supports or belt supporting plates 16 and 17 bear against the inside of the belts for some distance toward the exit end of the machine to prevent undesired separation of the belts at this point.

A quantity of the loosely matted, tangled and twisted strands of steel wool, sufficient to form a single roll, being introduced into the machine between the divergent walls, the movement of the lower belt carries the mass to the right into the rectangular confined space between the belts and side walls. In its passage through this space (to the right, since the rolling course of the belt 1 moves to the right faster than the belt 2 moves to the left) the mass is turned over and over while held together by the side walls, and its component strands are thus worked into engagement with each other until the mass assumes the shape of a flat-ended cylinder and issues from the right of the machine as the solid compact and uniformly tenacious article illustrated at 18 (Fig. 1). At the exit end the machine may be provided with a table or extension 22 to receive the cylinders from the rolling belts and pass them on to the belt conveyor 23 which takes them away, and preferably a number of such machines are arranged along a single conveyor belt 23. The article 18 may be marketed in its original cylindrical form or may be readily re-shaped by compression into another form preferred by the user.

The rolled article 18 may in some instances give a suggestion of layer formation (as at 25) as though it had been rolled up from a strip of the matted wool, but the layer effect usually extends only part way around the cylinder and the interlocking of the strands across the apparent line of division is usually quite sufficient for the ordinary purposes, and in any event the demarcation line is so located that the user may readily hold the article so that no separation will occur in use.

The machine of Figures 5 and 6 is like that of the preceding figures, except that the belt 2, with its pulleys and driving belt 7, is eliminated and the fixed wall 28, extending from the entrance to the exit end of the machine, is substituted therefor. The belt 1 is assumed to travel to the right, enclosing metal side walls 13 and 14 are provided, and also backing support 16 extends for only a part of the distance from the exit end of the machine toward the entrance end, all as before.

It will be apparent that the principle of the invention, as explained by reference to the preferred form above described, can be carried out in a great variety of ways and by diverse forms of apparatus, all of which are intended to be comprehended by the appended claims.

I claim:

1. The method of compacting steel wool which consists in rolling a mass of loosely tangled strands into a cylinder while the mass is held in contact with opposing walls, thereby forming a flat-ended cylinder.

2. The method of producing a mass of steel wool substantially free of loosely connected bunches, which consists in rolling a mass of loosely connected bunches until the demarcations between the bunches substantially disappear.

3. A machine for the preparation of steel wool comprising surfaces adapted to receive a quantity of steel wool, and means for relatively moving said surfaces to roll said wool and thereby promote the interlocking of the filaments thereof.

4. A machine for the preparation of steel wool comprising opposing surfaces adapted to form a pass for masses of steel wool between them, and means for relatively moving said surfaces unidirectionally, to roll the masses of steel wool from the entrance end of the pass to the exit at the opposite end thereof, thereby promoting the interlocking of the filaments of the wool.

5. A machine for the preparation of steel wool consisting of relatively moving surfaces arranged to roll into a cylinder a quantity of steel wool strands inserted between them, and a pair of forming members en-
gaging the wool as the latter is rolled between said surfaces and serving to form flat ends on the wool cylinder.

6. A machine for the formation of cylinders of compacted metal wool, comprising a belt, pulleys for supporting and driving the belt, a member providing a surface parallel with a course of the belt, the belt traveling relatively to said surface and the surface and belt being spaced apart a distance sufficient to provide for the rolling of a quantity of loose metal wool placed between the two, and opposing side walls at the edges of the belt for completing the enclosure of the rolling space.

7. A machine for the formation of cylinders of compacted steel wool, comprising a belt, pulleys for supporting and driving the belt, a member providing a surface parallel with a straight course of the belt, the belt travelling unidirectionally relatively to said surface and the surface and belt being spaced apart a distance sufficient to provide for the rolling of a quantity of loose steel wool placed between the two, a backing support for the belt to support the course thereof of opposing said surface, and opposing side walls at the edges of the belt to engage the ends of the rolling mass of wool to form flat ends on the wool cylinder, said side walls being divergent at the entrance end of the machine.

8. A machine for the formation of solid cylinders of compacted steel wool, comprising a flexible driven belt, supporting pulleys, and therefor, a member providing a surface substantially parallel with a course of the belt and spaced therefrom a distance substantially equal to the diameter of the cylinder to be produced, and supporting means to support the belt for some distance only near the exit end of the machine to limit the separation of the belt from said surface at that point.

9. A machine for the formation of compacted cylinders of steel wool comprising members providing a pass of rectangular cross section, and means for moving one of said members to roll a quantity of loosely tangled steel wool through the pass.

In testimony whereof, I have signed this specification.

LAWRENCE STERN.