

UNITED STATES PATENT OFFICE

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MANUFACTURE OF CORDEAU

No Drawing.

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This invention relates to the manufacture of cordeau, and the principal object of the invention is to provide a novel and improved method of producing cordeau in the desired sizes and having certain novel and highly advantageous characteristics not possessed by this product as made under present methods.

Prior to our invention, cordeau has been made by filling a pipe or tube of lead or other suitable metal with molten trinitrotoluene, allowing the trinitrotoluene to cool, and then drawing the pipe down to the desired diameter either by running it through reducing rolls or by a drawing operation through suitable dies.

We have discovered a method of preparing cordeau not involving the rolling or drawing operation which not only simplifies the process but provides an actually improved and more highly sensitive product.

So far as the formation of the lead or other pipe, and the process of filling this pipe with the trinitrotoluene is concerned, our method may adhere closely to the present well known practices. Instead, however, of reducing the diameter of, and elongating, the pipe by means of a rolling or drawing operation, we subject the pipe to the action of rapidly moving hammers which beat the tube uniformly around its entire circumference, the result of this hammering or swaging operation, as will readily be understood, being to increase the length and decrease the diameter of the pipe containing the trinitrotoluene.

The method of arranging and operating the hammers may vary largely and forms no part of the present invention, although the mechanism employed may form the subject of another application.

In a preferred form of our invention, we may start with a tube of lead 14 mm. in outside diameter and 10 mm. in inside diameter and weighing approximately 800 grams per meter of length. This tube we charge with 120 grams of TNT per meter of length, according to any desired method. The filled tube is then subjected to the hammering or swaging operation in a succession of five operations; the first of which reduces the outside diameter from 14 mm. to 13 mm.; the

second reducing the outside diameter from 13 mm. to 10 mm.; the third operation reducing the outside diameter from 10 mm. to 8 mm.; the fourth operation reducing the outside diameter from 8 mm. to 7 mm., and the fifth and final operation reducing the outside diameter from 7 mm. to 6 mm. The resulting product in its preferred form weighs 130 grams per meter length, and comprises 85% of metallic lead and 15% of TNT. In the swaging operations, we have found that the material may be fed through the machines at a velocity of from 2 to 10 meters per minute, and we preferably allow six hours to elapse between each swaging operation to permit of the complete cooling of the inner TNT core and the auto-annealing of the metal sheath. Before each swaging operation, the material may be artificially cooled if desired.

It is desirable that the temperature of the TNT be maintained below the melting point of TNT, which is about 80° C., during the entire swaging process. This operation should accordingly be conducted at such a speed that the temperature does not at any time reach this temperature. The removal of the heat produced in the hammering treatments also may be maintained below the given maximum by directing a draft of air against the tube at the hammers and by maintaining a suitable quantity of oil on the surface of the cordeau being treated. Other methods of preventing excessive temperatures may be resorted to as desired.

One of the principal advantages of this method of manufacture resides in the effect which the rapid hammering has upon the fused trinitrotoluene. Fused trinitrotoluene is relatively insensitive to detonation, and accordingly it is highly essential that the TNT in cordeau shall be in a fine state of subdivision. While the previous methods of rolling and drawing obtain the desired effect in some degree, we have discovered that the rapid pounding operation described above, to which the fused trinitrotoluene is subjected, reduces the latter to an even finer state of subdivision and provides a cordeau which is materially more sensitive than cordeau pro-

duced by the previous methods of manufacture.

In addition to this highly important and desirable effect upon the trinitrotoluene, cordeau made by our swaging method possesses greater strength than cordeau as previously manufactured, by reason of the compacting and strengthening of the lead or other sheath by the hammering operation. Also the final product is smoother than that which results from either drawing or rolling, which is of assistance in the further operation of "countering", or covering the cordeau with a protective coating of spirally wrapped cords. Our process further eliminates the weakening effect upon the lead or other sheath resulting from the application of tensile strain in the drawing operation, and leads to a more uniform thickness in the sheath than can be obtained through the squeezing or rolling operation.

It will be understood that the specific procedure outlined above is provided merely by way of illustration, and that the invention is in no manner limited thereto, nor to any number of individual swaging operations in reducing the tubes to the desired diameter. Under favorable conditions, we have on occasion produced the final product in a single swaging operation. Obviously also the invention is not limited to the use of TNT, since it is applicable generally to the manufacture of cordeau regardless of the particular detonating agent employed.

We claim:

1. The method of forming cordeau, which consists in taking a metallic tube containing fused trinitrotoluene, and mechanically working said tube by hammer blows to extend the length and decrease the diameter thereof, while maintaining the temperature within the tube continuously below the melting point of the contained trinitrotoluene.

2. The method of forming cordeau, which consists in taking a metallic tube containing a detonating agent, and mechanically working said tube by hammer blows to extend the length and decrease the diameter thereof and simultaneously to comminute the contained detonating agent.

3. In the manufacture of cordeau, the step which consists in subjecting the metal sheath with the contained solid detonating agent to hammering sufficient to reduce the said agent to finely divided form.

4. The method of forming cordeau, which consists in taking a ductile metal tube containing a detonating agent, and subjecting the tube to the action of hammer blows uniformly distributed over its surface and of sufficient force to reduce the contained explosive to finely divided forms.

5. The method of forming cordeau, which consists in taking a metallic tube containing a fused detonating agent, and mechanically

working said tube by hammering to extend the length and decrease the diameter thereof, while maintaining the temperature within the tube continuously below the melting point of the contained detonating agent.

6. As a new article of manufacture, cordeau comprising a hammered sheath, and a contained detonating agent in a state of fine subdivision from said hammering.

7. The process of increasing the sensitivity of detonating fuse, which comprises uniformly hammering the entire outer wall of such fuse to comminute a detonating agent within such fuse.

8. The process which comprises filling a tube with a fused detonating agent, cooling to solidify the detonating agent, and thereafter comminuting the solidified detonating agent by hammer blows directed upon the wall of the tube.

9. In the manufacture of cordeau, the step which consists in simultaneously elongating the sheath, and reducing the detonating agent to finely divided form by swaging the said sheath with its contained solidified detonating agent.

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