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USE OF T. N. T., A WAR-SALVAGED EXPLOSIVE, FOR PEACE-TIME PURPOSES.

ARTICLE ON USE OF T. N. T., A WAR-SALVAGED EXPLOSIVE, FOR PEACE-TIME PURPOSES, BY JOHN SWENEHART, UNIVERSITY OF WISCONSIN.

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A low-priced and effective explosive is one of the great needs in making available for settlement the large areas of undeveloped land in the cut-over States.

A conservative estimate places the lands adapted to agriculture in the upper Mississippi River States alone at 35,000,000 acres. That this land is fertile has been shown by the thousands of settlers already on the ground. Many of these families are building farms and futures there; their greatest need is more land cleared. In most instances they have the necessary labor, but little money. Explosives they must have—the more abundant and inexpensive the shorter the road to success.

EMPIRES AWAIT DEVELOPMENT.

Estimates made by the United States Soil Survey and the various colleges of agriculture show that the value of the land in these States when reclaimed will be increased by more than $1,000,000,000. The hastening of the day when this land will be settled and under the plow will mark an epoch in the development of these districts.

In addition to the vast area yet to be reclaimed in the upper Mississippi River Valley there are the cut-over lands of the South, which are some of the most fertile in the country. In such States as Georgia, Alabama, Louisiana, and Mississippi the development of the cut-over lands represents one of the country's largest problems. While figures are not available indicating the value of the reclamation of these lands, it is obvious that the amounts are enormous.

RECLAMATION NATIONALLY IMPORTANT.

Similarly in the Pacific Northwest, there are large areas of rich land awaiting development. The part which explosives are to play in this development must be important. No matter how much machinery is available, and no matter what other methods may be devised, vast quantities of explosives will always be needed. When it is realized that the cost of developing each acre in the upper Lake States and over a great portion of the southern pine land is less than the annual returns from prevailing crops, it will be evident that anything which aids in a quicker development of this resource is of national importance.

T. N. T. OFFERS A SOLUTION.

T. N. T., or trinitrotoluene, one of the high-powered explosives of the war, has made good under trial in land clearing. This explosive could be of great service to the settlers of cut-over regions.

Through the cooperation of the Departments of War and the Interior, rather extensive test of the efficiency of T. N. T. in land clearing have been made in Wisconsin by representatives of the College of Agriculture of the University of Wisconsin.

Practical trials on nearly 2,000 farms, tests made by State and Federal agents, have all demonstrated its value and its usability. As a result of these tests, a widespread demand has arisen among the citizens of this new farming region. Thousands of requests have been made by these settlers for supplies from the Government and State authorities who supervised the distribution of the salvaged war explosive. In fact, in Wisconsin alone the demand was for more than 4,000,000 pounds.

As compared with dynamites, regardless of their grade and manufacture, T. N. T. has been found stronger and yet fully as safe and easy to use. Its alleged insensibility can be easily overcome by the use of a larger detonator. It is not any more susceptible to moisture than the best of the ordinary dynamites. It is not affected by freezing. It has much less poisonous effects on the user when it is used properly cartridged.

T. N. T. CAN BE MADE AVAILABLE AT LOW COST.

The war supplies of T. N. T. can likely be cartridged and made available for use at a cost of less than 10 cents a pound. The authorities in Wisconsin have successfully cartridged, packed, and distributed their 200,000-pound supply at a total cost of $16,000, or about 8 cents a pound.

This does not include much of the expense of distribution which was handled by banks, county agents, and others. Nor does it include freight from the cartridging plant to the actual user. It does include, of course, the original cost of rather crude equipment and necessary plant for doing the work.

The prevailing size of dynamite cartridges is $1\frac{1}{4}$ inches in diameter by 8 inches in length. If cartridges of T. N. T. are made this size, they can be used with the same tools that were formerly used for dynamite. T. N. T. is more bulky than dynamite, and therefore this size of cartridge will weigh only about $5\frac{1}{3}$ to $5\frac{1}{2}$ ounces instead of 8 ounces, which is the weight of a standard cartridge of dynamite.

The war supplies of T. N. T. have not deteriorated when stored in a dry place for reasonable length of time. The difficulty in providind a safe, dry, storage place on a cut-over farm should discourage storage of this or any other explosive material for more than one season. Freezing and changes in temperature do not appear to have any effect on the action of T. N. T. in field work on stumps and bowlders. This makes it unnecessary to thaw the material in cold weather, which has been the source of accidents in connection with handling nitroglycerin dynamites. The user has frequently placed his dynamite near the fire or in an oven and serious accidents have often resulted.

HOW T. N. T. IS USED IN LAND CLEARING.

T. N. T. is a yellow crystalline powder, made in three grades, differing technically but not in practical application. Grade II is the one most commonly available from the war surplus. This varies in color from different manufactures, being often light yellow in

color and very dry. It may also be dark brown and somewhat greasy. For practical purposes in stump work, no account need be taken of these variations in color or appearance.

In strength T. N. T. is about one-third stronger than ordinary dynamites when loads of less than 2 pounds are used. If the quantity of material used in one load is above 2 pounds, the T. N. T. seems to exert a stronger effect than ordinary dynamites. Large loads should therefore be used with care, as the explosion is much more violent and pieces of the stumps are thrown farther. A No. 8 blasting cap is required for complete detonation. The use of a No. 6 cap will result in misfires unless conditions are just right. The No. 8 cap is the same as that used for dynamite, except that the cap is larger. The same kinds of fuse can be used. Either common blasting caps and fuse or electric caps and blasting machine may be used. The electric method of firing explosives is recommended.

The hole for the charge is made in the same way as would be necessary with dynamite, except that the T. N. T. charge should not be extended out any length in the hole due to its insensitiveness. Enlarge the hole at the bottom so that the charge will be well "bunched." A common term in connection with dynamite is to "spring the hole," where a large charge is used. A spoon with a long handle may also be used to enlarge the hole at the bottom for this purpose. This is not needed where small loads are used under small stumps. In order to enable a charge to be packed down in the hole, the sides of the cartridge may be slit with a knife. There is no danger in using a knife in this way.

NO PLACE FOR CARELESSNESS.

T. N. T. is much less sensitive to shocks than ordinary dynamite and therefore requires a larger cap to set it off or detonate it. While it is safe to use, this does not mean that it is less dangerous than other explosives. It is a high explosive and therefore dangerous. T. N. T. burns readily and is much more sensitive when burning. Burning T. N. T. is also very difficult to extinguish. Every precaution should be taken to keep fire and sparks away from the material.

In placing the cap in the cartridge it is highly desirable to use a proper instrument. The handle of the cap crimper is made for this work and should be used. Be sure that the cap is placed lengthwise of the charge, so that the "business end" of the cap points toward the mass of the charge. It is not well to try to use too short a fuse. The cap should be crimped on the fuse properly. This can only be done with a cap crimper. The use of the steel-pointed handle of the cap crimper to punch holes in the T. N. T. for the cap is not dangerous.

It is often desirable to use a primer made with a No. 5 cap and a small piece of dynamite to set off the charge of T. N. T. The dynamite is exploded by the smaller cap, and this sets off the T. N. T. This is almost necessary if a No. 8 cap is not available.

Tamp the charge firmly in the hole and then tamp the earth in the hole above the charge tight to the top. Only in this way can a full benefit of the charge be realized. Be careful that dirt is not mixed with the explosive, as this may prevent the charge from going off.

T. N. T. HAS OTHER AGRICULTURAL USES.

Drainage work.—Ditches can be made with T. N. T. but on account of its insensitiveness, a No. 8 electric cap is necessary in each charge.

Propagated firing can not be used. It is impossible to make ditches economically with the material without an electric blasting outfit.

Breaking bowlders.—T. N. T. has proven very good for bowlder blasting either by mud capping or by drilling a hole in the rock to be blasted. Mud capping, or "bulldozing," as it is sometimes called, is the most common method. In this work, T. N. T. is used in the same way as high-grade dynamites are used, being careful not to get moisture or soil mixed with the charge. About one-third to one-half less of the material is used than of dynamite.

Road work.—T. N. T. can also be satisfactorily used for road work. It could be used very effectively for moving earth as well as for loosening rock in cuts where a road bed is being prepared. In fact, T. N. T. readily adapts itself to any use where the work is done in open air and where a relatively insensitive explosion is possible.

PRECAUTIONS NECESSARY IN HANDLING AND USING T. N. T.

Special care should be taken to keep empty T. N. T. cartridges, packing material, or boxes away from livestock. As soon as the T. N. T. is used, all this packing material should be burned in the open air. Explosives accidents have been known to happen from using this material in stoves.

T. N. T. which is permitted to become wet from any cause will not give good results. If more than 10 per cent of water is present in the material, it is not detonated by ordinary means. For this reason the material should not be poured out of the cartridges in the bore hole, as moisture from the soil will prevent some of the material from detonating. It is not best to leave a load stand in a hole too long before firing. It is, however, less effected by moisture than ordinary dynamites. Particular care should be taken to prevent moisture and soil from mixing with the T. N. T. in the bore hole as this makes the material still less sensitive and may cause misfires or incomplete explosion.

The material need not be mixed with other substances. It is not rated in percentage strengths as is common with dynamite. It has no nitro-glycerin in it. In practice, when used in the field, no ill effects on the users have been observed. Handling the material raw in any quantity is strongly discouraged except under the proper supervision in cartridging plants. On account of the poisonous effects on the user when the raw material is handled, it is very important that T. N. T. is not distributed to the public without properly cartridging it in waterproof paper cartridges. These waterproof paper cartridges also eliminate any effect of moisture which would be encountered in practical land clearing operations.

Special precaution should be taken in the use of T. N. T. where large loads are necessary. T. N. T. when used in large loads, say more than 5 or 6 pounds, becomes a very high shattering explosive and therefore much more dangerous in the hands of the comparatively inexperienced operator. Land-clearing work as a rule does not require excessive loads in Wisconsin and other Lake States. When used, however, in large loads for any purpose, it should be remembered that the characteristic shattering effect of the war explosive is to be observed under these conditions and pieces of stump, rock, or soil will be thrown farther and therefore the operation becomes more dangerous.

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