Five hundred miles of open ditches in Wisconsin are dammed up with soil and rubbish washed in. Many of these ditches are on the higher priced and most productive lands in the state. Often these ditches have grown up to cut tails, willows etc. Such ditches are, to a large extent, of little value. Outlets are closed, land is wasted, labor is expended without return because of partial or complete crop failure.

On some of these jobs, some sort of a dredge is the most economical method of cleaning. In other cases, particularly where yardage is small, the cost of putting in a dredge is often prohibitive. It is in these places that explosives may be of help, particularly in view of the availability of low priced materials and the fact that the work can be done without any particular equipment.

It is believed that a combination of pyrotol, the new explosive prepared from surplus war materials, can be used in combination with fifty per cent straight nitro-glycerin dynamite in many operations to move soil from the ditch at a cost of between fifteen and twenty-five cents per cubic yard. The pyrotol costs $7.90 per one hundred pounds delivered in carload lots in Wisconsin and is secured by farmers through the College of Agriculture. Fifty per cent straight nitro-glycerin dynamite is a commercial product secured from all powder companies at a wholesale price of $18.75 per one hundred pounds in lots of two thousand pounds delivered to any railroad station.

Pyrotol cannot be used alone in ditch blasting without the use of expensive electric blasting caps in each charge. This practice ordinarily prohibits the use of such a method. The use of not less
than one-quarter pound of the straight nitro-glycerin dynamite in each charge permits the use of the so-called propagated blasting methods where one charge sets off the next when they are placed in a row eighteen or twenty inches apart. The soil must be saturated with water so that water immediately rises in the holes where the charge is made as it is the water in the soil which carries the explosive wave. The dynamite used to carry the explosive wave must be the so-called straight nitro-glycerin and not less than fifty per cent strength. Ordinary ammonia dynamite will not propagate. While the work can be done in cold weather, it is obvious that a temperature above freezing is necessary, even though most explosive manufacturers can now furnish a straight nitro-glycerin dynamite which will stand temperatures below freezing.

In placing the charges it is usually well to run a line down the center of the ditch. This line can be marked every eighteen inches in some convenient manner so that the charges may be easily and properly spaced. As a rule, the water level can be used to establish the depth of the charges. The effect of the explosion will probably deepen the ditch to from three to six inches below the bottom of the charge, depending on the soil conditions. After the line is set, a man with a round stick, usually a long-handled shovel handle marked at eighteen and twenty-four inches, so that the operator may know how deep he is going, punches the hole down to within a few inches of the bottom of the proposed ditch. Immediately after the stick is withdrawn a cartridge of pyrocol and the necessary half cartridge or more of straight nitro-glycerin is put in, the straight nitro-glycerin primer being put on top.

It is impossible here to state exactly how much will be needed but a few trial shots will soon indicate how much to load. It is
also possible to change the depth of distance to get the desired results. If the distance apart, the depth and the quantity of explosive used is correct, the ditch will be "U" shaped and the banks not badly disturbed. If the load is too deep and too heavy, the depth will be "V" shaped and the banks will be disturbed. If the charges are too far apart, the ditch will be irregular.

After the loads have been placed, a single primer is placed in the center; that is, an extra cartridge of the straight nitroglycerin in which has been placed a blasting cap fitted to a length of fuse. This primer should be waterproofed with a heavy grease to protect it from moisture as it has to be placed in the water. This one cap sets off the entire line of charges. It is usually unwise to try to shoot more than one hundred feet at a time as conditions may change and different loadings may be necessary as the job progresses. Naturally, a wind blowing across the ditch will prevent soil from falling back into the ditch. Sometimes it may be necessary to wait for a breeze in order to get the best results from the ditching work. Unless the old ditch banks are very high however, this is seldom necessary.

The use of explosives in ditch clean-cut work leaves little spoil banks as the soil is scattered over several rods on each side. Very few tools are needed, tamping stick, cap crimper and the necessary guide line. Any number of men may work conveniently at the job. No investment is tied up. An ordinary man can soon learn the method. Individuals or districts can avail themselves of it although districts may not purchase pyrotel. A farmer living near an open canal can clean his own ditch and receive direct benefit. Other dynamites may be used in place of pyrotel with slight increase in cost. Under some conditions such as a thin watery muck the
use of straight sixty per cent nitro-glycerin dynamite for the whole charge is necessary.

It seems up to farmers as well as drainage commissioners and engineers to protect their investments in open ditches, particularly in rich and otherwise valuable land by keeping ditches open.

It is possible for commissioners of a district to arrange for some man in the district to learn how to do the work for the district. If crowds are avoided, more work will be done and less chance of accident. Explosive, caps and fuse can be ordered by the district through the local dealer if there is one, or direct from the jobber or manufacturer. A demonstration from the department of agricultural engineering will teach a man from any district how to do the work, spending a day with him. With a few trial shots on any new job a good man will do effective work.

Since ditch clean-out work involves largely the removal of mud, the job is not dangerous if reasonable precautions are taken. Telephone or power lines twenty or thirty feet from ditch will not be damaged unless load is heavy and wind blows mud over the line.

Where willows are growing in ditch, increased quantities of explosive will remove them. Only experience will determine how much to add.

For the propagated charge there must be water enough that the hole for charge fills up when stick is pulled out. More water is unnecessary load for explosive and required heavier loading. In this case start at lower end of ditch and let excess water run out.