Removing Stumps at Moderate Cost

J. L. Ashlock, of the Washington State College, Gives Much Valuable Information.

(Concluded.)

WHILE the process as described succeeded very well in Woodland clearings and elsewhere where similar conditions prevailed, Sparks very soon found that in other localities it would fail. For instance, the Woodland method would not do the business in sandy soil.

It took many months to surmount this difficulty. Finally, laying aside for the moment the study of different mechanical steps to produce burning, Sparks delved into the science of heat, radiation, combusion, and kindred subjects, seeking in the foundation sciences of it all the solution for his problem. He eventually succeeded, working out his conclusion in this wise:

The covering is put on the wood to keep the air from reaching the fire in a volume which would produce complete combustion. But that is not all. The covering is put on to conserve the heat. Therefore, a good covering must be a non-conductor of heat. Such a covering should be loose and fluffy, one which does not run together and solidify under the influence of heat. Clay is such a covering, and sand is not.

Now, why is this true? Well, in the first place, "dead air" is the most effective barrier to the radiation of heat that is known. Anyone who has built a house or even lived in one, knows that a house with double walls is warmer in the winter than a house with single walls. But what has this to do with the covering over the kindling wood which is to fire a stump?

Simply this: Each minute pore space in the soil composing the cover contains a small bit of air. The sum total of air thus retained is considerable, and is a dead air space. Heat escaping through the covering must warm the imprisoned air before getting out, and that is not quickly done. So the heat of the fire is held under the cover.

Right Kind of Soil.

Clay is the right kind of soil, but why? There are two principal reasons. The first is that clay soils are usually enriched by a considerable amount of decayed organic material, leaves, particles of roots, and other combustible substance. When the clay becomes intensely heated, the organic material is consumed, leaving small cavities which immediately fill up with air. Thus a clay soil becomes light and fluffy when subjected to heat.

The second reason why clay is good for a covering is that it does not run into the fire and smother it. In this particular, sand fails. The particles are so loosely "bound" together that they sift down into the fire, and also, when the organic material contained in the sand is burned out, the mass settles together in a solid mass. Sand used for a covering not only smothers the fire by pouring into it, but packs together and excludes the air, making combustion quite impossible.

To overcome the difficulties encountered where sandy covering is alone available, Sparks tried artificial coverings such as sheet iron, tin and the like, all of which failed. He also tried lime, tar, and many different substances as a "binder" to hold the sandy soil together, and again failed. Finally he tried cinders and ashes for the covering where clay soil was not available. He succeeded. Ashes, while unlike clay, remain light and fluffy during the firing, which is the desirable thing.

Recent Demonstration.

In a recent demonstration showing how to char-pit stumps in sandy soil, the bark was removed from the stumps and roots where the fire was to be applied. A shallow trench was made around the stump, and into this was placed the fuel covered over with a mixture of ashes and cinders. Two operators fired 18 stumps in six hours, and 15 were burning the following morning. Three had been put out by a heavy rain. The other stumps were char-pitted.

In the way described the problem of sandy soils was settled. Then another difficulty arose. When the soil was right, and all other conditions for firing apparently ideal, failures would nevertheless occur. Men would fire their stumps, some of which would burn out, and others would fail, though it seemed that all the stumps had been treated in the same way.

Upon investigating such cases, Sparks discovered that where failures occured, it seemed to be because the top of the stump had been burned instead of the base and roots. Another class of failures were apparently due to neither the top nor the roots having taken the fire. This desultory kind of success did not add to the popularity of char-pitting stumps, and for months the outcome of the investigations was dubious.

Sparks again took up the scientific side of the question. Radiated heat, he reasoned, travels in straight lines, and when it strikes an opposing surface, the angle at which it is deflected is equal to the angle at which it strikes. That is, if the bulk of the imprisoned heat comes against the inner part of the covering along perpendicular lines, it will be thrown back perpendicularly, or into the fire. But if the lines along which the heat approached the cover formed an angle the bulk of the heat would either be thrown into the stump higher up, or away from the stump into the ground, this depending of course upon the angle of contact. In other words, if the cover were piled too high up the side of the stump, and if it were flattened too much, most of the heat would be driven into the ground. In either case, firing would not occur. The heat from the fire should be driven back along perpendicular lines into the fire from which it came. The intense heat generated by this manner of radiation and reflection is shown by the occasional forming of a clinker under the crown of the stump.

To overcome the difficulty which is experienced in regulating the height of the cover, beginners are simply advised to experiment till they find how high the pile should be for their particular conditions. No definite rule can be given.

Suitable Fuels.

Another line of experimentation has been to find different fuels which are cheap and suitable for use where wood cannot readily be obtained for kindling, which is often the case in seasons of prolonged rain. Fuel oil has been found to be very good for this purpose. This is the same material which is used by oil burning locomotives. In using this fuel oil for stump burning, the stumps are prepared by taking off the bark and digging away the surface soil to a depth of six or seven inches, making a trench about a foot wide and the side sloping toward the stump. Some sawdust is put in the trench, or in the absence of sawdust, a few chips. The kindling is necessary to ignite the oil, which, like coal, will not burn well until heated. Then the oil is poured over the kindling. Next, some bark and pieces of wood are thrown over the fuel oil to hold the covering up. Next, clay or cinders are put on, or soil, if it is the right kind. From this point on the usual care is given. It is not necessary to use fuel oil in dry seasons where combustible material can be secured.

Recent experiments have been made with the view of reducing the amount of fuel necessary to start the fire. Stumps were selected where two roots were located about the right distance apart for a small fire between them. Then the bark was removed, after which a small hole about a foot deep was dug between the roots. Then an auger hole was bored from the side of each root opposite the hole, piercing down and across the roots, and coming out about half way between the ground line and the bottom of the hole.

Then the fire was started in the hole, using not more kindling than could easily be carried at one armful. When the fuel had burned down to a bed of coals, one pint of fuel oil was poured down each of the auger holes, the holes then being covered over lightly to prevent too strong a draft. The following day it was found that the stumps had been successfully fired. The advantage of using auger holes is that there is afforded the opportunity of supplying the fire with concentrated fuel without disturbing the cover, and the auger holes furnish a vent through and under the wet sapwood, thus evaporating moisture in the wood and making it more susceptible to the fire.

How Fires Are Built.

Hardwood trees are not common in Washington and Oregon, so experiments up to this time are limited in that direction. Hemlock stumps have been burned, however, an odd but effective device being used. A number of 30-penny nails were driven into spots of the wood which would be exposed to the fire, five or six nails being driven into each spot. The heads of the spikes were left sticking out about an inch. The fire was then built in the usual way. Iron is a good conductor of heat, so when the fire was burning, the heat followed the nails into the wood, drying out and making it more combustible. The stumps were destroyed in this way.

Green stumps will burn very well when started, though they are a little more difficult to fire. The bark, which is nature's protection to the growing tree against the extremes of temperature, should be removed. Chop through the sapwood in a few places. Then with good kindling and ordinary care, green stumps may be fired. In experiments which have been made in clearings of Oregon and Washington, stumps of all kinds, from 50 years old to a few weeks, have been burned out.

More difficult to handle than green stumps of otherwise fairly combustible wood, are the stumps of white fir and cedar. The former trees are also known as balsam. Balsam stumps frequently become so wet that they will not float. Cedar stumps likewise will absorb much moisture. Furthermore, their roots are often small and numerous, and it is the big roots which yield most readily to char-pitting. Men of Western Washington and Oregon who have succeeded in char-pitting other tree stumps, report many absolute failures with cedar and white fir. Among them it is quite generally agreed that in bottoms where white fir and cedar predominates, the char-pit method is more difficult of operation than on benches where red fir and equally combustible stumps are found in soil which is of a clayey consistency.

Sparks, however, has succeeded in firing white fir and cedar, and, while acknowledging it to be a difficult thing to do, believes that it can be done where the necessary preliminary steps are taken. His method begins with the chopping away of the bark and sapwood and the exposing of as much of the roots as possible so that in the dry season the stumps can dry out. He does the firing in the very dryest season of the year. Auger holes are bored into the stumps, nails are driven in, pitch and other concentrated fuel is used in the kindling, and every precaution is taken to dry the stump and make the fire as hot as fire can be made. The cover should be put on with every possible care.

Pitch For Kindling.

While pitch is useful in the kindling, pitch in the stump retards the process. This is because charcoal-burning is largely a matter of distillation, and an excess of resinous substance in the stump naturally makes the process of distillation slower; that is, the pitchy constituent of wood is distilled off instead of burning as it does in an open flame. Rather curiously, water an entirely non-combustible substance, and pitch which is highly inflammable, alike retard the process of char-pitting.

Of the economic importance of a method of removing stumps which is within reach of the man who by necessity is compelled to rely upon his bare hands, his ax, and fire, and which can be operated successfully upon all stumps of ordinarily combustible wood as big as they grow and down to eight or twelve inches in diameter, little need be said. In Washington alone there is a strip of land paralleling Puget Sound, which is from 15 to 30 miles in width and 150 miles long, much of which has not been reclaimed from the forest clearings. Estimates which are accepted as approximately correct by the agricultural experts of the state, indicate that this undeveloped empire should yield $50,000,000 annually in agricultural produce; that it is capable of supporting ten times the population it now supports; that five acres of the land is quite sufficient for an average-sized family. Quite recently the State College has been informed that preparations are under way to rid several thousand acres of this land of stumps by the char-pitting method during the coming summer. A few months ago the commissioners of one of the Sound counties let a contract for the removal of stumps from a county road by the charring process, and a 15-year-old boy whose home was in the neighborhood where the work was done, caught the idea of it, and within a few weeks had burnt out 165 giant stumps from his home clearing, doing the work unassisted by older persons.

But even this leaves a wide margin of value for the char-pitting process. It is the stump of diameter ranging from 24 to 60 inches that puts dismay into the heart of the farmer. He knows that by hard work he can get out the scrubby growth. Perhaps he can even afford to use an inexpensive charge of powder now and then to split and loosen the smaller stumps. Show him how to get the big ones out, and before many months have passed, he will have a tillable clearing.

Natural gas has been found on a farm a few miles west of the town of Dauphin, Manitoba, which is about 178 miles northwest of Winnipeg. It is reported that the gas has been burning with the flame six feet above the ground for several days.