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THE COST OF CLEARING LOGGED-OFF LAND
FOR FARMING IN THE PACIFIC
NORTHWEST.

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THE COST OF CLEARING LOGGED-OFF LAND FOR FARMING IN THE PACIFIC NORTHWEST.

INTRODUCTION.^a

The rapid decrease of merchantable timber and the consequent increasing acreage of logged-off land have brought to the attention of the people of the Pacific Northwest the importance of the agricultural development of this section of the United States.



FIG. 1.—Logged-off land cleared of stumps in winter and sowed to oats in spring. Estimated crop, 75 bushels per acre.

In order to make this land suitable for agricultural purposes it must be cleared for the plow. To do this the standing timber, the logs, the underbrush, and the stumps must be removed. (See fig. 1.)

^a Much of the farming in this country is done upon land formerly occupied by forests. At various times in the history of the country information on this subject has been of importance in almost every section. The main body of forest land which has been put into cultivation was cleared off many years before there were agricultural experiment stations, so that there have practically been no investigations concerning the methods and cost of preparing cleared land for the plow. At the present time the question is important in several regions, and while there has been abundant experience in work of this character this experience has never been recorded and is not available now to those engaged in clearing land for agriculture. During the past summer the Department employed Mr. Thompson to gather up so far as possible all the information available from the experience of those who have in recent years put into cultivation logged-off land in the Pacific Northwest. This circular is a summary of the information thus obtained. As the demand for this information is urgent, it is thought best to publish it in the form of a circular.—B. T. GALLOWAY, *Physiologist and Pathologist, and Chief of Bureau.*

A preliminary investigation of the situation was made during the summer of 1908 to determine the extent of the logged-off land, the methods in use at the present time, and as nearly as possible the cost of clearing by the different methods used. No experiments were undertaken, and consequently no definite figures can be given in regard to the cost of clearing by the different methods in use except as given by contractors and owners who had kept the cost of clearing separate from other expenses. The territory covered in this investigation embraces western Washington, western Oregon, and northern California.

THE EXTENT OF LOGGED-OFF LAND.

In the State of Washington the 18 counties west of the Cascade Mountains have a total area of 8,700,000 acres of assessed land, as



FIG 2.—Stump pasture land.

given by the various assessors of the respective counties. Of this, 429,000 acres are in cultivation or improved pasture, 5,034,000 acres in standing merchantable timber, and 2,352,000 in logged-off land. From this it will be seen that 27 per cent of the total acreage is logged-off land and that the acreage in cultivation, much of which is pasture land from which the large stumps have not been removed (fig. 2), is only 5 per cent of the whole area. Table I shows the acreages for each of these 18 counties.

TABLE I.—Counties of western Washington, showing the acreage in cultivation, in timber, and in logged-off land.

County.	Acreage in merchantable timber.	Acreage logged off.	Acreage in cultivation.	Total acreage.	Per cent suitable for agriculture.
Chehalis.....	583,200	112,758	11,216	807,432	90
Clallam.....	296,611	195,933	11,784	504,329	75
Clarke.....	190,000	108,661	51,570	350,231	.....
Cowlitz.....	500,000	25,000	20,000	705,000	75
Island.....	8,013	99,866	9,317	117,196	75
Jefferson.....	186,647	59,427	4,657	254,385	50
King.....	640,000	1,0,000	74,857	1,243,000	.....
Kitsap.....	45,429	171,364	7,978	224,771	.....
Lewis.....	543,995	160,425	47,059	884,050	65
Mason.....	240,211	150,430	7,540	398,181	.....
Pacific.....	367,827	62,720	23,042	453,139	.....
Pierce.....	413,044	150,000	27,915	685,052	75
San Juan.....	10,000	80,000	4,000	95,084	.....
Skagit.....	306,759	149,923	45,605	502,287	25
Snohomish.....	258,005	270,422	29,908	558,336	.....
Thurston.....	291,200	120,000	13,680	428,005	.....
Wahkiakum.....	79,564	67,327	3,642	145,544	50
Whatcom.....	78,405	258,302	35,059	371,766	.....
Total.....	5,033,911	2,352,109	428,829	8,700,388	.....

The timber lands in western Oregon and northern California are not nearly so accessible as those of western Washington. Neither is there nearly so much logged-off land, nor is this land so well adapted for agricultural purposes as that in Washington. While the demand for farm land in Oregon and California is well supplied by prairie and easily cleared brush land, the necessity for reclaiming the logged-off land in these States is not pressing. On the other hand, western Washington has but few valleys that were not heavily timbered at one time, and the demand for agricultural products far exceeds the local supply. Consequently, the demand for farm land and the idle wastes of cut-over land has brought the question of clearing this land squarely before the people. The character of the clearing ranges from the heavily timbered spruce and cedar lowlands through the benches and side hills covered with fir stumps and a dense growth of underbrush to the more sparsely covered hemlock ridges.

The spruce stump is thought to be the most expensive to remove, owing to the fact that it is found only on the deepest soil, where it roots deeply, it often requiring a box (50 pounds) of stumping powder to loosen a single stump 5 feet in diameter.

The fir stump is the predominating stump of all logged-off lands in Washington and Oregon, and is removed by various methods described below.

The cedar grows to some extent wherever the fir is found and predominates on low ground.

All of the above trees have lateral root systems and do not root deeply except in loose or sandy soil, where the roots penetrate to a depth of several feet. On flooded or swampy land the roots are often partly above the surface.

In the logged-off lands of the redwood district of northern California there has been little effort made to clear the land for agricultural purposes, since prairie land is plentiful and the logged-off land is rough and hilly.

Some attempts have been made to clear the land of everything but the stumps and then to seed to orchard grass for cattle range. This work of clearing has been done for \$10 per acre. This method of making range has proved a failure in most cases, as the great quantity of brush and the sucker growth of the redwood stumps have almost entirely covered the ground in two or three years.

It is estimated that the logged-off land of California can be reclaimed at about the same expense as the fir-stump land of Oregon and Washington.

Most of the clearing that has been done in Oregon was done by cheap labor until recent years. The donkey-engine method has been used in some sections of the State recently.

HAND METHOD OF CLEARING LOGGED-OFF LAND.

Until recent years clearing was almost wholly done by what is now known as the "by-hand" method, where the farmer, equipped with peavey, mattock, shovel, and ax, undertook to put under cultivation the logger's stubble field. By this method the standing trees and brush were slashed, generally during the summer months. Then, in September or October, after the first rainfall or when there was no danger to neighboring improvements or timber, a fire was started and allowed to burn over the entire slashing, when most of the brush and small logs were burned completely. The remaining logs were sawed into convenient lengths, piled, and burned. After the rains had softened the ground sufficiently the smaller stumps and roots were grubbed and pulled out. Often a stump puller of the capstan type was used in pulling the smaller stumps after they had been loosened by digging around them.

This type of stump puller is often used in clearing small tracts after the stumps have been broken into several pieces and loosened by the use of stumping powder, without which no clearing is undertaken in the present day. The stump puller should be of simple construction, strongly built. It generally consists of a drum, a wire cable, and a sweep to which a team is hitched. Powder has been used in all clearing operations for several years, and all methods, except that of burning the stumps below the plow, are dependent upon it to loosen the stumps so that they may be taken out. It is said that a cheap explosive that would do this work would go a long way toward solving the problem of reclaiming the logged-off land.

DONKEY-ENGINE METHOD OF CLEARING LOGGED-OFF LAND.

Some six or seven years ago when logs were down in the market and many logging outfits were idle, an enterprising logger took a contract for pulling the stumps from a meadow. He conceived the idea of using his donkey engine with its outfit of blocks and cables to pull and pile the stumps for burning (fig. 3). Since that time many such outfits have been engaged with varying success in clearing land. The usual method is to slash and burn over the tract to be cleared, in order to burn all the underbrush and as many small logs as possible.

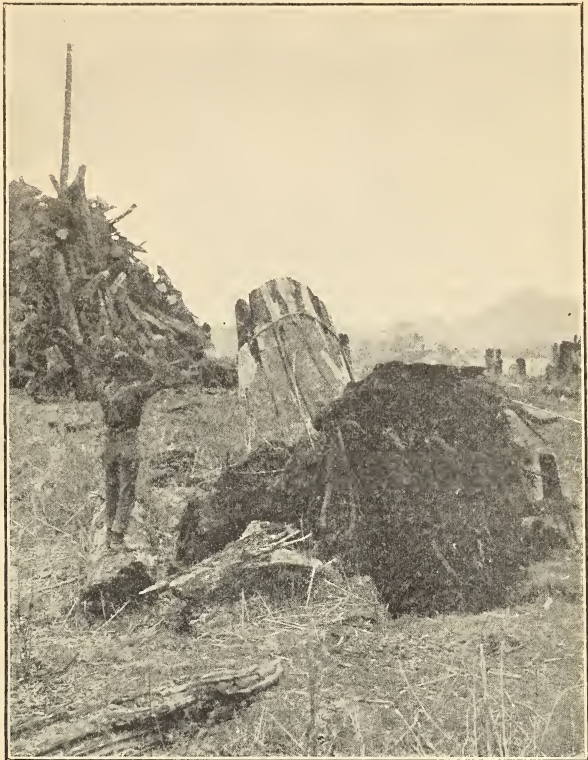


FIG. 3.—Pulling a stump with a donkey engine.

Then all the stumps more than 1 foot in diameter are split and loosened by a charge of stumping powder of from five to twenty sticks, according to size. A charge of twenty 1½-inch by 8-inch sticks will generally split a 5-foot stump into five pieces

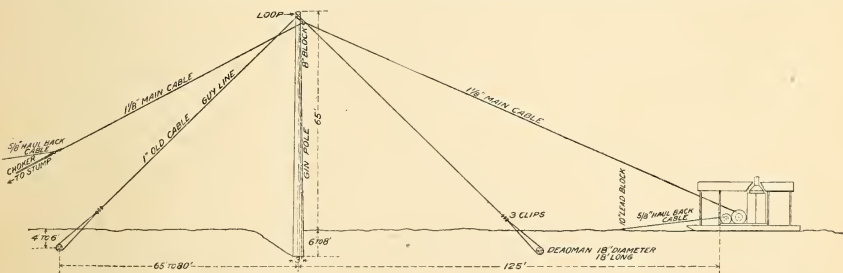


FIG. 4.—Elevation showing method of setting donkey engine and gin pole in clearing land.

and loosen it so that an engine can pull the pieces from the ground. A gin pole is now set in the center of a tract of 8 or 10 acres and held in place by four guy lines from the top. (See fig. 4.) This pole

should be 60 feet or more above the ground. A block is fixed securely near the top of the gin pole, through which is passed the main cable from the engine. This cable has the usual hook, ring, and swivels at the end, and is usually 1 inch or $1\frac{1}{8}$ inches in diameter.

The haul-back cable, which is usually $\frac{5}{8}$ inch in diameter, is now taken to a lead block and passed around three sides of one-fourth of the tract to be cleared at this setting of the gin pole (see fig. 5), and

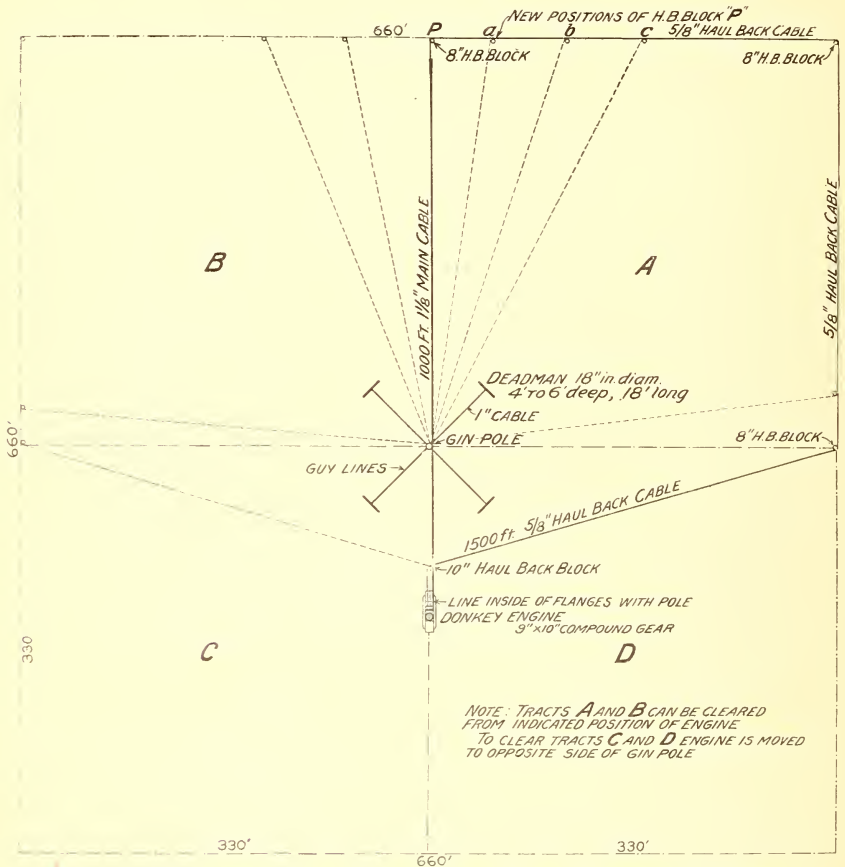


FIG. 5.—Diagram showing position of donkey engine and rigging for clearing a 10-acre tract.

the end hooked into the ring of the main cable, thus forming an endless cable with the engine—one that will run in either direction to or from the gin pole.

In some cases, where the engine is built with the haul-back-cable drum above the main-cable drum, it is better to fasten the block for the main cable about 5 feet from the top of the pole and run the haul-back cable through a block on top of the pole. The haul-back drum is usually geared to run much faster than the main-cable drum.

Each outfit should have on hand at least four chokers and a supply of lead lines and extra blocks. A choker is a section of cable from 20 to 30 feet in length, with a loop in one end and a choker hook on the other.

The choker is passed around the stump and hooked upon itself. The loop is then caught in the hook of the main cable, and the load is ready to go to the pile.

While this load is going to the pile another is made ready, so that there is no time lost. When the cable returns with the empty choker it is loosened and another hooked into its place. As the loads come to the gin pole they are piled around it as closely as possible (fig. 6) by a man on the pile.



FIG. 6.—Stumps piled around gin pole in clearing with donkey engine.

This method, while an economic success in the hands of a few, has proved a costly method of clearing as handled by many others. If everything is handled to advantage by capable, experienced men this method has many points to its credit over any other method of clearing now in use, the greatest of which is the saving of time. It is also cheaper than the "by-hand" methods on large tracts of heavy clearing.

The question of using a large or small donkey engine has been discussed, but those who have been most successful in clearing are generally in favor of an engine with sufficient power to take all roots out with a straight pull, avoiding the use of blocks. A 9 by 10 inch compound gear, or 10 by 12 inch single gear, is said to be the best size for this work.

METHODS OF BURNING STUMPS.

The first method of burning out fir stumps described below has been used by almost all farmers and others who have done any clearing in a small way.

This method consists of boring two intersecting holes (see fig. 7) in the stump and starting a fire at the point of intersection by putting coals of fire or a piece of iron heated to a white heat into the upper auger hole. A window weight with a wire fastened in the eye makes a good iron for this purpose, as it can be taken out and used again and again.

After firing, the stump will not require any attention until the portion shown in figure 7 *A* is burned out, as the pitch in the stump and the draft of the air through the holes will keep the fire burning. After the upper portion of the stump has been burned away, the fire may be kept up by throwing in the bark and litter that are always to

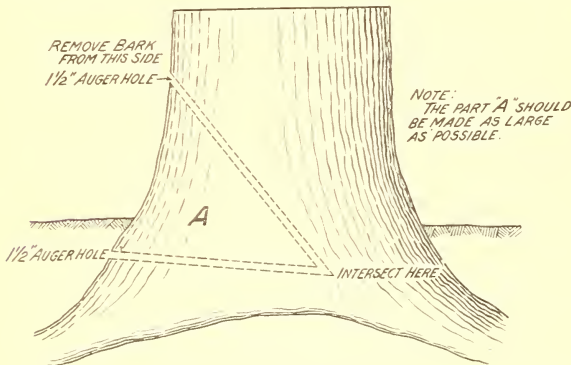


Fig. 7.—Diagram showing method of preparing a stump for burning.

be found near by. By this means the main part of the stump is burned away, leaving the larger stringers with their smaller roots. These may be pulled out by a team or with a stump puller, or they may be entirely burned by digging away the earth and rolling a

small log alongside of the root. This leaves but few small roots to be grubbed out by hand. By this method the soil is but little disturbed, the subsoil is not scattered over the surface, and the ashes are left where most needed. This method requires less leveling than where holes are made by the use of powder.

It is said that one man can burn out thirty large stumps a week by this method and can cut up and pile the logs near by at the same time.

Another method of burning out stumps is to split the stump with a small charge of powder, which nearly always makes a large hole underneath and around the stump. This hole is then filled with kindling and other wood and fired. Of the remaining roots, those that lie near the surface are grubbed out, while the others are cut off to a depth of from 12 to 18 inches below the surface.

Charcoaling or pitting stumps, as it is called, is a method of burning out stumps that has been little used, but where tried has proved very efficient.

The bark should be removed from the stumps in the spring or early summer to allow the outside of the stump to become thoroughly dry. Often it is well to dig a trench around, or to level the ground near the stump; then a ring of wood is stood or piled closely about the stump to a height of 2 feet and 1 foot thick (see fig. 8). Dry rotten wood or bark such as is found in abundance on any new land will answer the purpose. This is then completely covered with sod to a depth of several inches, except a small space on the side the wind is blowing against. Where no sod is to be found the wood

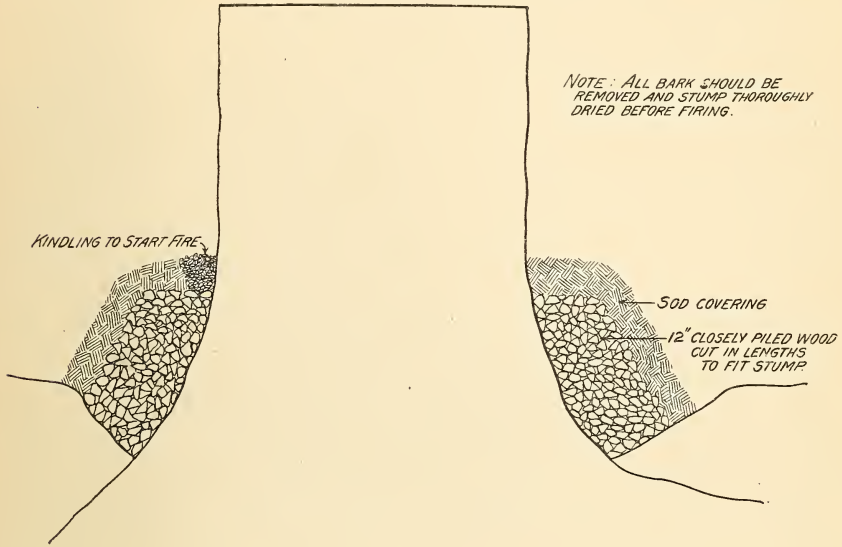


FIG. 8.—Diagram showing method of charcoaling or pitting stumps.

can first be covered with a layer of bark, small brush, or ferns to keep the loose earth from sifting through. Fine kindling is placed in the open space and fire started and allowed to burn openly until the ring of wood is well afire; then a piece of bark or a bunch of ferns or grass is thrown over the hole and the sod covering completed. The stump must now be closely watched and the fire not allowed to burn through the covering, more sod being added as needed. The whole secret of burning the stump completely is to keep the covering intact. If the roots are kept well covered and are re-covered as soon as the earth caves, exposing them to the air, they will burn out completely.

This method is very economical for large stumps. Small stumps can be grubbed or pulled out to better advantage. After ten days it will be found that the stumps require very little attention.

The cost of this method of removing stumps is said to be \$2 each.

The disadvantage of using this method is the time it takes, as it requires several weeks for a large stump to burn out completely.

USE OF CHEMICALS IN BURNING STUMPS.

The treatment of stumps by boring holes into the top and filling them with a strong solution of saltpeter and after six months or a year saturating the stump with coal oil and setting fire to it, when it is supposed to burn to the smallest root, has never been tried to any extent.

Mr. K. O. Walders, of Hamilton, Wash., writes of this method, but does not say to what extent he has used it. He also recommends the use of a strong solution of vitriol to deaden cottonwood, maple, and alder stumps and prevent sprouting.

On large fir, spruce, and hemlock stumps, Mr. Walder's method is to bore four deep holes and pour an equal amount of nitric and of sulphuric acid into each hole. The holes are then tightly plugged. In a year the stump is permeated with the acids and can be fired in the dry season. No results obtained from the use of this method are given.

A STUMP-BURNING MACHINE.

A machine used for burning stumps consists of a gasoline engine, a blower, a distributor, and several lengths of hose with short lengths of pipe on one end.

The air from the blower is divided into twelve or sixteen equal parts by the distributor, to which are connected the several lengths of hose, some of which are long and some short.

A hole is bored in the stump at the ground line or, better still, the earth is dug away and the hole bored from 6 to 12 inches below the surface.

A piece of iron heated to a white heat is then dropped into the hole and a blast of air turned upon it by inserting a pipe attached to the end of the hose which is of less diameter than the hole bored in the stump. The large diameter of the hole permits the gases to escape.

As many stumps can be burned at the same time as there are lengths of hose, or two or more lines of hose can be used on the same stump.

This machine is still in the experimental stage. A few have been successful in operating it, while others have pronounced it a failure. It is thought that if this machine is perfected it will be a cheap and economical method of destroying stumps.

Mr. F. I. Mead, of Tacoma, Wash., says that by using this machine he has been able to do heavy clearing for \$50 per acre. Mr. J. H. Davis, of Georgetown, Wash., has used this machine in clearing 46 acres that averaged 40 stumps per acre, at a cost of \$65 per acre.

USE OF POWDER IN CLEARING LOGGED-OFF LAND.

At the present time few undertake to clear even a small tract of land without the use of powder, and in the hands of an experienced man powder can be made to do a large amount of work at comparatively small expense.

The powder in general use at the present time is known as stumping powder and is put up in sticks of 1½ by 8 inches, about 65 of which come in a box of 50 pounds. This powder costs at the present retail price \$6.25 a box; in ton lots, \$5.25 a box.

The charge of powder is placed as nearly as possible beneath the center of the stump. The powder should be placed on the hardpan if the soil is not too deep; otherwise it is placed from 2 to 3 feet below the surface.

To get the best results the sticks are removed from the paper wrappers and packed closely together in the hole beneath the stump. This can not be done in wet places. The powder works best when the temperature is about 70° F.

This powder has more effect when the soil is saturated with water. The wrappers are allowed to remain upon the sticks in wet places.

The following charges will be found effective under average ground conditions and where using stump pullers or blocks and teams:

Diameter of stumps in inches.....	18	24	30	36	48	60	72
Sticks of powder.....	5	7	10	20	35	50	65

Where the soil is sandy and loose it will require one-half more powder for the same size stump.

As this powder does not work well at a temperature below 70° F., it is necessary when using it in cold weather to keep it warm by some method. Some powder men bury the boxes in a manure pile; others lay it upon a perforated rack over boiling water. As in either of these methods the powder becomes more or less damp from the vapor it is thought that when dry heat is applied better results are obtained.

Charles Shirk, of Bellingham, Wash., has used a box similar to the one shown in the illustration (fig. 9) for heating powder and thinks his is the best method to use for this purpose. This box is built upon a sled and has a tin partition, on one side of which is placed a small airtight heating stove, while on the other are shelves of wire screen on which the sticks of powder are loosely laid. The box shown in the illustration will hold 100 pounds of powder, and it may be kept at the desired temperature in the coldest weather.

It is well to employ a powder man who has had experience in blowing out stumps, as the saving in powder alone will more than pay his wages.

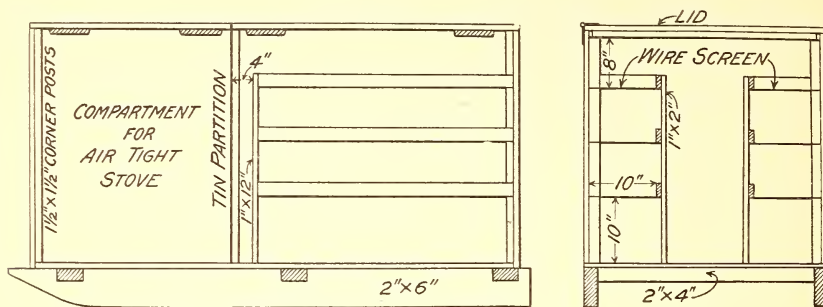


FIG. 11.—Box for keeping powder warm.

The following statement of stumping done by the Narrows Land Company, of Tacoma, Wash., for six months in 1907 will give an idea of the cost of the different items of material used and the labor in blasting stumps.

TABLE 11.—Cost of removing fr stumps from 1 foot to 4 feet in diameter from 120 acres of land in 1907.

Month.	Powder.		Fuse.	Caps.	Stumps.	Labor.	
	Pounds.	Feet.	Number.	Number.	Hours.	Dollars.	
June.....	13,700	10,100	2,400	2,135	2,380	650.00	
July.....	1,750	2,050	400	239	260	87.00	
August.....	2,750	2,700	700	445	324	114.90	
September.....	1,950	2,150	500	383	324	126.37	
October.....	1,250	1,000	300	238	198	77.53	
November.....	2,350	3,100	800	378	283	114.97	
Total.....	23,750	21,100	5,100	3,818	3,769	1,170.77	
Average per stump.....	6.22	5.52	1.33	0.987	0.3066		
Average cost in cents.....	19.76	2.37	.87				

The average cost of the removal of each stump is shown below:

Powder.	Fuse.	Caps.	Labor.	Total.
Cents. 49.76	Cents. 2.37	Cents. 0.87	Cents. 30.66	Cents. 83.66

The average cost of the materials used was as follows: Powder, per pound, 8 cents; fuse, per 100 feet, 43 cents; caps, per 100, 65 cents.

COST OF VARIOUS METHODS OF CLEARING LAND.

It has been a difficult matter to get definite figures on the cost of clearing land by the different methods in use, chiefly because the farmers or those who have cleared land have not kept detailed records. Often the cost can not be determined because included with other work.

The following table shows the cost given by the owner or contractor of clearing land by the various methods described; also the quantity of powder used, the kind of land cleared, etc.:

TABLE III.—Cost of clearing land by various methods.

Owner.	Address.	Method.	Number of acres.	Kind of land.
N. E. Ryther	Riverton, Wash.	Powder and stump puller.	2	Bench land.
Chas. Rheinhart	Seattle, Wash.	do.	2	Low land.
Seaboard Sec. Co.	do.	do.	35	Bench land.
J. Burg	Foster, Wash.	Powder and team.	10	High land.
A. J. Erickson	do.	Powder and burning.	2	Do.
Do.	Tacoma, Wash.	Powder and grubbing.	2	Do.
B. F. Allison	Midland, Wash.	Donkey engine.	40	Do.
Far West Lumber Co.	Tacoma, Wash.	do.	100	Do.
Narrows Land Co.	do.	do.	5	Do.
Arcadia Irrig. Assn.	Spokane, Wash.	Donkey engine and stump puller.	1,000	Do.
J. E. Larkin	Lake Bay, Wash.	Donkey engine.	50	High and low land.
Otto Wood	Marysville, Wash.	do.	5	High land.
C. H. Quast	Getchell, Wash.	do.	7	Low land.
I. Johnson	Stanwood, Wash.	do.	12	Do.
Mr. Colvin	Mount Vernon, Wash.	do.	23	Valley land.
Mr. Willis	do.	do.	20	Do.
M. Doran	Bow, Wash.	do.	12	Do.
Do.	do.	do.	24	Do.
L. Eckman	Mount Vernon, Wash.	do.	12	Do.
B. B. I. Co.	Bellingham, Wash.	do.	20	High land.
Do.	do.	do.	67	Do.
Lake Whateom Logging Co.	do.	do.	10	Bench land.
Ed. Bardou	do.	do.	20	Valley land.
Peterson Bros.	Kenmore, Wash.	do.	40	Bench land.
R. Kinnear	Fall City, Wash.	do.	10	Do.
Do.	do.	Powder and team.	4	Bench clay.
Robt. Chabot	Moclips, Wash.	Powder and grubbing.	10	Do.
C. Mankowski	Aberdeen, Wash.	do.	1 ¹ / ₆	Low bench.
W. G. Hopkins	do.	Donkey engine.	700	Valley land.
Do.	do.	do.	300	Bench land.
E. S. Avey	Elma, Wash.	Powder and grubbing.	11	Valley land.
Do.	do.	do.	4	High land.
F. C. Dunhan	do.	do.	5	Bench land.
Do.	do.	do.	1	Do.
Wm. Harding	do.	Grubbing.	5	Do.
Geo. Simpson	do.	Grubbing and team.	25	Valley land.
A. S. Caton	Olympia, Wash.	Donkey engine.	35	High land.
Geo. Uhler	do.	Powder and stump puller.	6	Bench land.
H. H. Tilley	Centralia, Wash.	do.	13 ¹ / ₂	High land.
J. H. Davis	Georgetown, Wash.	Stump burning machine.	46 ¹ / ₆	Do.
W. B. Alderman	Tillamook, Oreg.	Donkey engine.	9	Valley land.
Christensen & Co.	do.	do.	1	Do.
Bagley & Streets	Woodville, Oreg.	do.	80	Bench land.
M. Harvey	Charleston, Wash.	Powder and team.	2	Do.
Do.	do.	do.	17	Do.

Owner.	Pounds of powder.	Cost of labor.	Cost per acre.	Remarks.
N. E. Ryther			\$200.00	
Chas. Rheinhart	350		200.00	Many large cedar stumps.
Seaboard Sec. Co.			125.00	Contract.
J. Burg	2,000		120.00	
A. J. Erickson	50		100.00	Own time estimated.
Do.			112.00	Contract.
B. F. Allison	7,500		218.00	All grubbing and leveling included.
Far West Lumber Co.			105.00	80 acres cleared for plow; 80 acres cleared for pasture; stumps not removed.
Narrows Land Co.	1,200	\$479.32	116.60	48 stumps per acre.
Arcadia Irrig. Assn.			75 to 125	Light clearing.
J. E. Larkin			100 to 150	In small tracts.
Otto Wood	1,000		90.00	Stumps only; other tracts from \$100 to \$150 per acre.
C. H. Quast			120.00	Heavy clearing.
I. Johnson	1,700		84.00	
Mr. Colvin			26.00	Meadow; 15 stumps per acre.
Mr. Willis	4,550	1,600.00	105.00	
M. Doran			36.00	Cleared of stumps only.
Do.			40.00	Do.
L. Eckman	1,450		100.00	Approximated; spruce stumps.

TABLE III.—*Cost of clearing land by various methods—Continued.*

Owner.	Pounds of powder.	Cost of labor.	Cost per acre.	Remarks.
B. B. I. Co.			\$55.00	2½ days' time; cleared of stumps only.
Do.			68.00	Light clearing.
Lake Whatcom Logging Co.	900	\$1,010.30	123.00	Heavy clearing.
Ed. Bardon	3,800		100.00	Approximated.
Peterson Bros.			115.00	Contract.
R. Kinnear	500		100.00	Approximated.
Do.			130.00	
Robt. Chabot			150.00	Do.
C. Mankowski			357.00	Green timber—hemlock, fir, spruce.
W. G. Hopkins			30.00	Brush; few stumps.
Do.			100.00	
E. S. Avey			43.00	Vine, maple, and cottonwood.
Do.			100.00	
F. C. Dunhan			100.00	Second-growth fir, 1' to 3'.
Do.	400	80.00	138.00	Large fir stumps.
Wm. Harding	None.		125.00	Approximated.
Geo. Simpson			40.00	Large stumps not taken out.
A. S. Caton	10,000		125.00	Heavy clearing.
Geo. Uhler	900	205.00	50.00	Meadow; cedar and fir stumps only.
H. H. Tilley	4,000		90.00	
J. H. Davis	None.		65.00	40 stumps per acre.
W. B. Alderman	2,300		125.00	Spruce stumps; some work done before.
Christensen & Co.	300	60.00	100.00	Spruce stumps only; other work done.
Bagley & Streets	2,500		a 20.00	Wood and lumber sold from this tract; 6,0 cords wood, 80 M feet b. m. lumber.
M. Harvey			150.00	
Do.	4,000		105.00	U. S. magazine site—18' below surface.

a Net.

From the foregoing table of the cost of clearing land it will be seen that it is only very rich land, or that which is near the centers of population, that will at the present time pay interest on the capital invested to put it under cultivation.

Better returns from other forms of investment have kept capitalists from forming companies to clear these logged-off lands. It will readily be seen that this would require a large capitalization, as the average farmer could only pay for the clearing of his land in small installments.

It has been suggested that the State or county working under a law similar to the one under which bonds are issued for draining land, whereby a part of the bonds and the interest are paid each year by the small annual payments of the owners benefited, might aid in this work of reclaiming these wastes.

Where there are several owners of land in the same vicinity who desire to clear land they could do much by forming a cooperative company to buy machinery and powder and hire the experienced help needed. All those who have cleared logged-off land are united in saying that there is a great deal learned in connection with the first tract of land cleared and are convinced that they could clear the second tract very much cheaper.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., January 28, 1909.