Table I.—Average Amount of Powder Used for Each Size of Stump

Plot No. 1.

| Diameter, ins. | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 48 | 52 | 56 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sticks powder | 1 | 1.5 | 2 | 3 | 4 | 4.5 | 5 | 6 | 7.5 | 8.5 | 10.5 | 12.5 | 13.5 | 14.5 | 15.5 | 16.5 | 18 | 19 | 20 | 21 | 24 | 26 | 28 |
| Pounds | .6 | 1 | 1.2 | 2 | 2.5 | 2.8 | 3.1 | 3.7 | 4.7 | 5.3 | 6.6 | 7.8 | 8.4 | 9.1 | 9.7 | 10.3 | 11.2 | 11.9 | 12.5 | 13.2 | 15 | 16.2 | 17.5 |
| Pounds per ft. diam. | 1.2 | 1.5 | 1.5 | 2 | 2.14 | 2.1 | 2.06 | 2.22 | 2.5 | 2.65 | 3.04 | 2.63 | 3.36 | 3.41 | 3.42 | 3.44 | 3.53 | 3.57 | 3.57 | 3.60 | 3.75 | 3.74 | 3.75 |
| Cost per ft. diam. (cts.) | 19 | 24 | 24 | 32 | 34 | 34 | 34 | 35 | 40 | 41 | 39 | 42 | 54 | 55 | 55 | 56 | 56.5 | 57 | 57 | 57.5 | 60 | 60 | 60 |
| Cost per stump (cts.) | 9.6 | 16 | 20 | 32 | 40 | 45 | 50 | 59 | 75 | 85 | 105 | 128 | 134 | 145 | 155 | 165 | 179 | 190 | 200 | 211 | 240 | 259 | 280 |

Plot No. 2.

| Diameter, ins. | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 48 | 52 | 56 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pounds | 7 | 1 | 1.2 | 2 | 2.5 | 2.6 | 3.3 | 4.2 | 5 | 5.5 | 6.2 | 7.5 | 8.1 | 8.8 | 9.3 | 10 | 11.5 | 12 | 12.5 | 13 | 15 | 16 | 17.5 |
| Pounds per ft. diam. | 1.4 | 1.5 | 1.5 | 2 | 2.14 | 1.9 | 2.2 | 2.52 | 2.7 | 2.75 | 2.86 | 3.21 | 3.26 | 3.3 | 3.28 | 3.6 | 3.63 | 3.6 | 3.57 | 3.54 | 3.73 | 3.69 | 3.75 |
| Cost per ft. diam. (cts.) | 24 | 25 | 25 | 34 | 36 | 32 | 37 | 43 | 46 | 47 | 49 | 55 | 55 | 56 | 56 | 61 | 62 | 61 | 60 | 60 | 63 | 63 | 64 |
| Cost per stump (cts.) | 12 | 17 | 21 | 34 | 42 | 44 | 56 | 71 | 85 | 93 | 105 | 127 | 138 | 149 | 158 | 170 | 195 | 204 | 212 | 231 | 255 | 272 | 297 |

its energy is expended in loosening the soil without removing the stump and the effectiveness of the other charges is thus greatly reduced, whereas if all are exploded at once each has equal lifting power because of the proper conditions of soil firmness under which each does its work.

Where only one hole is used in removing the stump it is cheaper to use blasting caps rather than electric fuse, and is usually as effective. This is true unless the stumps are so close together that the ground around others will be loosened. In such cases a battery should be used and the entire group fired at once.

The labor cost of the blasting was as follows:

| | Plot No. 1 | | | Plot No. 2 | | |
|---|---|---|---|---|---|---|
| | Hours. | Rate. | Total. | Hours. | Rate. | Total. |
| Powderman | 58 | $0.35 | $20.20 | 41 | $0.35 | $14.35 |
| Helper | 58 | .25 | 14.50 | 68 | .25 | 17.00 |
| Total | | | $34.70 | | | $31.35 |
| Per acre | | | 6.94 | | | 6.27 |

### Strength of Caps

The lower the strength of powder the greater the strength of cap necessary to secure the greatest efficiency. This had been definitely determined by the United States War Department. Many persons make the serious mistake of using low-power caps because they are cheap. The War Department has shown that 40 per cent. dynamite is 15 per cent. stronger when a No. 5 cap is used than when a No. 3 cap is used; while the difference is only 6 per cent. when 60 per cent. dynamite is used. When several stumps stand together, electric fuses and a battery should be used, the stumps being connected in a series.

### Quantity of Powder to Use

Great care was used to determine just the proper amount of powder necessary for different sizes and species of stumps. In general, one should so strive to place the charges under a stump, both in position and amount, as to exert a pressure under each main division of it sufficient to just throw the stump out of the ground. Either a larger or a smaller charge is wasteful. The use of an insufficient amount of powder cracks the stump and so loosens the soil as to make the final removal with powder costly. When a second blast is necessary more powder is often required to remove the shattered stump than would have been necessary to have completely removed the stump in the first attempt. For this reason it is always better to use a slight excess of powder as a factor of safety, thus insuring the removal of the stump at the first trial.

Since the efficiency of powder varies with the varying conditions of soil, moisture, stumps, etc., this problem must be worked out in a general way for each locality. A little careful study and experimentation in starting work in a new field will save much powder, time and labor.

### Piling and Burning the Stumps

In piling the stumps, four men were found necessary with each team in order to secure the greatest efficiency. All the loose fragments were drawn to the log heaps and piled as high as possible by hand; sometimes separate piles of stumps alone were made when this was most convenient. A ginpole was not used as it was thought that by being careful to bring the larger fragments to the piles at first, and while they were low, nothing would be gained

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