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The Scaling Practices
in
The Port Orford Cedar Region

by

James M. Ellis

A Thesis

Presented to the Faculty

of the

School of Forestry

Oregon State College

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In Partial Fullfillment

of the Requirements for the Degree

Bachelor of Science

June 1938

SCHOOL OF FORESTRY
OREGON STATE COLLEGE
CORVALLIS, OREGON

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INTRODUCTION

The purpose of this paper is to give the reader an idea of the magnitude and importance of the scaler's job and to give some inkling as to the scaling practices in the Port Orford Cedar Region. I have tried to make this treatise as comprehensible to the readers as is possible by using the minimum of technical terms. In the places that I have used technical terms I have tried to explain them as fully as possible in terms easily understood by the average reader.

A good many persons have the idea that scaling is nothing but guess work. I here assure them that this is most certainly not the case,but that the science of scaling, for it is in a philosophical sense a science, is well compounded. There are no exact or fixed rules in the true senses of the word, but there are certain scaling practices that are more or less standard in their particular regions. In this paper I have tried to give you the practices that are paramount in the Port Orford Cedar Region.

A scaler has many and varied problems to face each and every day. It takes a man of integrity, initiative, and industry to meet these daily problems and to judge and execute his judgment to the fullest degree. During the course of his work he has many obstacles to overcome. The scaler must exercise his

faculties to their fullest extent at all times no matter what conditions are existent at the time. One moment he may be praised to the skies and feeling on top of the world and the next moment, through no fault of his own, he may be bullied and his opinions and statements may be opposed; he is probably feeling pretty low, but no matter what or how he is feeling he must not allow the frailities of nature to affect his judgment upon any of his problems. It may be rather difficult at times but the scaler must work with an unbiased opinion at all times. This is particularly essential,for the buyer and the seller must receive their full value, no matter what the scaler's personal opinion of either party might be.

In the past there have been a few papers written on the scaling practices in the Pine and in the Douglas Fir Regions ,but to my knowledge none have touched upon the Port Orford Cedar.

The data I have assembled here is from the texts of several authors. In some instances I have quoted them verbatim,but where ever it was possible I have used their ideas in my own words. I have compounded a few of my own poor ideas and included them herein, but I hope they will not detract too much from the true worth of the paper. I have tried to acknowledge all of these references and to give credit where credit was due.

I have divided the text of my thesis into eight main topics more or less hinging one upon the other.

I. The purpose of scaling.

A. Definition of.

B. Quantity or quality scaling.

C. Qualifications of the scaler.

D. Scaling conditions.

E. Standardization of scaling practises.

II. The log rule used in the region.

A. Spaulding log rule.

B. Merits of this rule.

III. Measurement of diameters.

A. Where measured.

B. How measured.

C. Accuracy of these measurements.

D. Taper allowance.

E. Taking average diameters.

F. Log regarded as a cylinder.

IV. Measurement of lengths.

A. Minimum length scaled.

B. Maximum length scaled.

C. Trimming allowance.

D. Penalty scale.

E. Taper considerations.

V. Stamping and branding.

A. Purpose of.

VI. Defects commonly found in Port Orford Cedar.

A. Interior defects.

1.heart rot.

a. methods of allowing for.

2. butt rot.

a. method of allowing for.

3. bark rings.

a. method of allowing for.

4. heart checks.

a. method of allowing for.

B. Side defects.

1. cat faces.

a. deduction for.

2. fire scars.

a. deductions for.

3. lightning scars.

a. deductions for.

4. wind and sun checks.

a. deductions for.

C. Crook and sweep.

1. deductions for.

D. Crotch defects.

1. deductions for.

VII. Methods of allowing for defects.

A. Cutting in feet and inches.

B. Forest service method.

C. Percentage method.

VIII. Check scaling.

A. Purpose.

B. When and how often made.

C. Scaling conditions.

D. Number of logs scaled.

E. Tallying the check scale.

F. Accuracy requirements between the original and the check scales.

I now present my thesis.

PURPOSE

"Scaling is the measurement of logs for the purpose of ascertaining the quantity of sound lumber, boards, plank, and dimension stock that can be cut from any log."[1]

The thing most desired by all concerned with log scaling is a uniform scale. While the scaler or the log scale has little to do with the price of logs, nevertheless the quantity from the log scaler's work is an important factor in determining the value of the timber concerned. The timber owner, the logger, and the millman are entitled to a fair and uniform appraisal of the logs in which they have invested or are about to invest in.

Port Orford Cedar is scaled for the sound contents of the log rather than for any specific grade the log might cut out. The reasons for this are:

"1. The unit of measure is regarded as more stable, with less fluctuations from year to year, than where the lumber grades are followed.

2. Greater certainty is thus assured the purchaser as to what material he will be required to pay for through out the life of his contracts.

3. The basis of scaling is less subject to individual judgment. It is more readily learned by scalers and more uniformly applied, and is therefore more practicable as a common standard for a number of scalers in timber of varying size and quality.

4. Mill tallies are not required for effective application of the scale or to settle complaints of the purchaser. The obligation to check scale by mill tallies, as is implied in scaling to a certain lumber grade, is avoided.

5. The accuracy of the scale is directly and inexpensively determined by a check on the logs themselves."[2]

Proficient scaling reqires a knowledge of just how a log cuts out. The best way to train your eye and your judgment and to train scalers in making deductions for particular kinds of defects, is to see how these t defective logs look when opened up in the mill and to compare the loss of the defective log to that of a sound one of the same dimensions. The check at the mill should be the amount of defect shown in the lumber against the allowance the scaler made for the defect. Frequent mill checks are quite essential to the old timer as well as to the embryo scaler, not to correct the previous scale but to sharpen and train his judgment in making allowances for the various classes of defects.

A scaler carries on his work under constant and varying conditions. Today the sun may be shining and all conditions are the maximum for good scaling, but tomorrow it may be raining, the scaler probably is wet to the skin and all conditions are at the very worst for good scaling.

The scaler must at all times , no matter what scaling conditions are existent, be able to give the logger and the purchaser all that each has coming from a log. One day he may be petted and the next day , t through no fault of his own, may be looked upon as the scum of the earth. The scaler at no time should let the spoken opinions , as to his character or derivation, sway his judgment as to the quantity of lumber any log contains.

The scaler must know the log rule that is being used in the region both forwards and backwards. He must be familiar with all common defects of the region and the defects common to the timber he is scaling at the present time. In addition the scaler should have a rather complete knowledge of the logging conditions in the area he is working for this is essential in allowing for breakage and damage that might result from falling, bucking, yarding, loading and unloading.

In the Port Orford Cedar Region the logs are scaled either as they are loaded on the trucks or after the trucks have pulled away from the landing a short distance. When scaling the logs on the trucks he can do a more accurate job than if he were scaling the same logs on the water. Both ends of the log and the sides are generally visible to the scaler when scaling on the trucks. The sides and external indicators are not always as visible on the trucks as they are in the water. When scaling at the landing the scaler must always be on the lookout for the loading hooks and the lines. When scaling on the water you do not have to watch for these things and can thus give your entire attention to your job. To offset the disadvantage of scaling at the landing the scaler somtimes stop the trucks a short distance from the landings and here they can enjoy all of the advantages of scaling on the water.

A scaler is constantly dealing with problems that are beyond the scope of fixed rules. He must solve these problems and make his decisions and after once having made his decision he must have the courage to stick by his conclusions no matter what is said or done. These decisions he makes reflects back upon the profit or loss that the buyer or seller suffer on the purchase or sale of the logs.

There are certain fundamental principles that apply to scaling as a whole. There must be certain principles concerned for two scalers, under diversified conditions, to obtain uniform results on the same group of logs. It requires agreat deal of experience to make a scaler. It is said that a scaler is born and not made. This from a particular viewpoint may be true for it takes in herent judgment to be a scaler. If one does not have the faculty of judging he will not be able to do the job as it should be done.

In scaling one cannot experiment with the theories of others. He must go by the tried and true principles for there is too much at stake for him to try a venture into the unknown. When scaling for one party the degree of care necessary is not as great as that required when scaling commercially. When a man is scaling for the benefit of the buyer and the seller he must he must walk a straight line , with no deviations , as to fairness to both parties.

THE LOG RULE USED IN THIS AREA

All thfee of the large Port Orford outfits in in this region use the Spaulding Log Rule.

"The Spaulding Log Rule was adopted by statute in 1879 as the standard log rule for the state of California, and the values were given. This rule was constructed in 1868 from diagrams of logs from 10-96 inches in diameter, using an 11/32 inch saw kerf,and one inch lumber. It was tested by sawing logs of each diameter in two sawmills. The size of the slab (width of the minimum board) was varied according to the size of the log. This error in the construction of the rule tends to increase the over-run in the larger logs. The values were given for logs from 12-24 feet in length. The author directed that longer logs be scaled by doubling their values from the tables, and this practice was incorporated in the statute. Thus the rule neglects taper altogether. In scaling this practice of doubling the table values is not applied to logs longer than 36 feet. This constitutes the most serious defect of the rule at present. Owing to the large saw kerf considerable over-run is secured by the use of the modern band saw but the rule is fairly consistent, as are all well constructed diagram rules.

Seventy years ago this rule could have been smoothed out graphically, thus it is not surprising that it is not as accurate as it might be. Since the time of its construction there has been a great many improvements in the efficiency of the machinery and the overhead personnel as well. The closeness of the utilization permitted by the market conditions has now increased to a great extent as well. As would be expected,this rule under estimates the amount of lumber that can be produced, thus this tendency is particularly noticeable in the case of the logs of the smaller diameters. An additional reason for the under estimate is that no allowance has been made for taper. The diagram represented the small end of the log. In a modern sawmill, through taper sawing,an added quantity of short lumber will be cut from the tapering logs, but since this was not a common practice in 1868, no allowance was made for it in the construction of the rule.

The inaccuracies mentioned above, results inevitably in a material difference in the number of board feet, log scale,estimated to be obtained from a group of logs and the actual number of board feet, lumber tally, that are actually produced from them."3

OVER-RUN

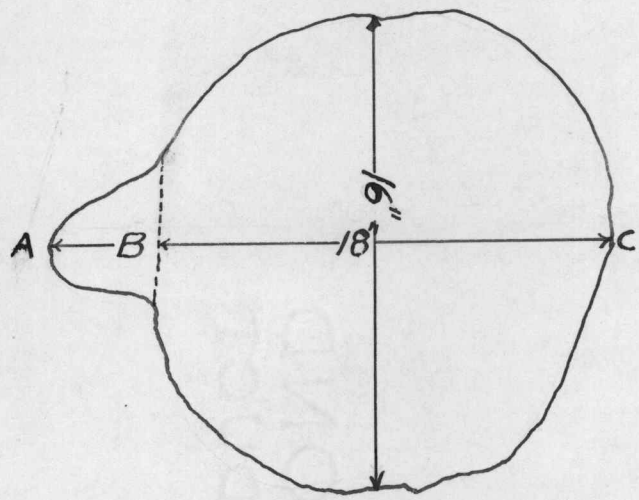
The over-run,or difference between the log scale and the lumber tally, goes to the manufacturer with no benefits to the seller. This one item has been, and in my opinion always will be, a source of argument for the seller or logger. When a scaler cuts a log more than the logger thinks it should be cut the standard argument is for the logger to start "beefing" about the quantity of over-run that the manufacturer will derive from the log in question. The only answer the scaler can give is that he is scaling the log as he sees it and if the parties concerned are not satisfied they are at liberty to obtain a new scaler whenever they so desire.

An over-run is expected by experienced lumbermen when this particular Spaulding or any diagram rule is used. How large this over-run will be is known from past experiences and there is no doubt that the percentage of over-run influences stumpage prices and contract rates.

The standard practice for a scaler is to make deductions for visible defects only which lie inside the scaling cylinder in each log no matter as to the amount of lumber lost because of this defect. This rule is not always observed. In certain species certain defects exist without visible indicators either on the ends or on the sides. There has been a tendency on the part of the log rule makers to reduce the standard volume of the log rules to offset for these invisible defects.

The use of a log rule that is known to give large over-runs usually gives rise to the practice of scaling sound and ignoring defects. The buyer can afford to be lenient and the seller objects to any further deductions than those inherent in the log rule itself; however in the Port Orford Cedar Region the scaling rules are as fixed as the governing of scale rules can be and there is seldom any deviation from the log rule.

Over-run is an element that influences log scaling. Where an admittedly lenient log rule is used the scaling practices and the standards of log scaling suffer and must therefore be guarded against.



Method of Determining Average Diameter of a Log

Care should be taken to ignore abnormal swellings. In the figure BC rather than AC should be taken as the diameter the long way. The average diameter should be the sum of the two above diameters divided by two.

Plate II

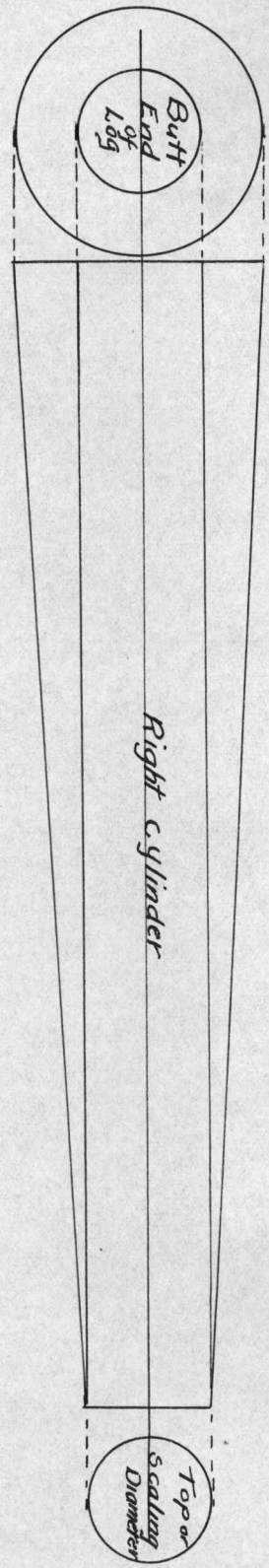
THE MEASUREMENT OF DIAMETERS

The measurement of diameters is a very important element in scaling in that it has considerable bearing on the quantity and consequently the value of the log scaled.

All diameters are measured inside the bark and at the small end. The diameters are rounded off to the nearest full inch above or below the actual diameter. Logs having a diameter of exactly half way will be thrown to the next lower inch.

In measuring diameters the scaler must guard against the abnormal growths that occur on the ends of the log such as knots, swells etc. The scaling diameter is assumed to be perfectly circular in the constrution of the log rule, but in actuallity it seldom is. When measuring diameters, measurements should be taken two or more ways and averaged to get the scaling diameter.

In measuring the diameter the log is assumed to be a cylinder with no regard as to taper. The scaling cylinder is taken to be at right angles to the small end or scaling diameter and running the entire length of the log. This cylinder must coincide with the axis of the log, so that the center of the cross section or area to be scaled coincides with the center of the butt or large end of the log. A common error made by a good many scalers is to shift the scaling diameter at the butt end of the log towards one side or the other to offset



The Right Cylinder of a Log

Plate I

for some minor defect that would otherwise be included in the scaling diameter or cylinder. This of course is obviously wrong and the scaler must guard against such a practice. If a defect appears in the scaling cylinder it should be deducted, but if it appears outside the scaling cylinder there should be no deduction.

When the top diameter is taken to determine the scaling diameter the log rule does not include any pieces or boards sawed from the taper or swell of the log. It is generally conceded that the mills will produce more lumber from long logs than from short logs. The reason Being that no al lowance is made for taper. In the Port Orford Cedar a two inch raise is given the second log in all logs over 24 feet in length. This is in some measure a remuneration to the contracter and cuts down the percentage of over-run that would result if no raise were given these second logs of the ones over 24 feet. This two inch raise, given the second log, is sometimes not wholly adequate as in the case of butt logs with large swell butts.

The taper of a log is another thorn in the side of the seller. He frequently gives vent to his feelings concerning the loss of the taper upon the scaler. He insists that he is being robbed and to his way of thinking is entirely correct in his assumption. However when they sign the contracts between the buyer and the seller

they know the log rule specified and they also know the percentage of over-run that will result from the use of the rule specified and therefore make their rates accordingly.

THE MEASUREMENT OF LENGTHS

In the Port Orford Cedar Region the longest single scaling length is twenty-four feet. All logs over 24 feet are scaled as two logs the butt log being scaled as the longer log; for example alog 30 feet long will be scaled as having a butt log of 16 feet and a top log of 14 feet in length. The minimum scaling length as a rule is 12 feet. The logs are scaled in the nearest two foot lengths of from 12 to 24 feet.

The mills desire logs of lengths 18,24, 28, 32, 36 with as few 20, 22, 26, 30, and 34 foot lengths as possible.

Each log must have a trimming allowance of not less than four inches. Large logs and long logs require a longer trimming allowance than do short or logs of smaller diameters. The reason for this is that when a bucker is making his run on a large log he might not be able to make as straight a cut as he could on a smller log and an angle cut would result.

The log lengths must be accurately taken, for a two foot error in length might not seem to be much of an error in the course of an entire days scaling the totals of these errors will mount up and culminate in quite a loss

for either of the parties concerned. The scaler might just as well get in the habit of making correct length measurements as not. A scaler after a certain length of time will be able to estimate these log lengths with quite an excellent degree of accuracy,but whenever in doubt measure.

BRANDING AND STAMPING

The purpose of branding the logs is fairly obvious. All the Port Orford Cedar logs are hauledto and dumped into Coos Bay. These logs belong to several different companies and are logged by different contractors. Each company and each logger has his own particular brand. The brands are usually the company's brand as a back ground with the brand of the individual loggers worked around it.

The branding hammers are about the same size and shape as a small sledge hammer and of about the same weight. The brand is in raised figures on the face of the hammer. When scaling a truck load of logs all the logs on the truck must be branded on at least one end before the truck is allowed to leave. If the logs are not branded neither the company nor the logger will receive any remuneration for them.

Some of the companies number their logs serially. This is a great deal of trouble at times and at other times is a great benefit and a help. Under this system the scale sheets and the logs must be so numbered as to keep

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their continuity throughout the entire operation. The purpose of numbering the logs is to enable the scaler to make a correct tally for the entire operation. The scale of each merchantable log is entered on the scale sheet opposite its number in the column thus provided for it. Numbering the logs will also serve as a check in case of a re-scale and offers the examining scaler a check on every log.

The other method used by the companies, is to stamp the net scale on the butt or top end of the log itself. This method does away with the necessity of having the original scaler's tally sheets in order to make the check scale. In my opinion this method is much faster and does away with the added book work of the other system.

DEFECTS COMMONLY FOUND IN THE PORT ORFORD CEDAR

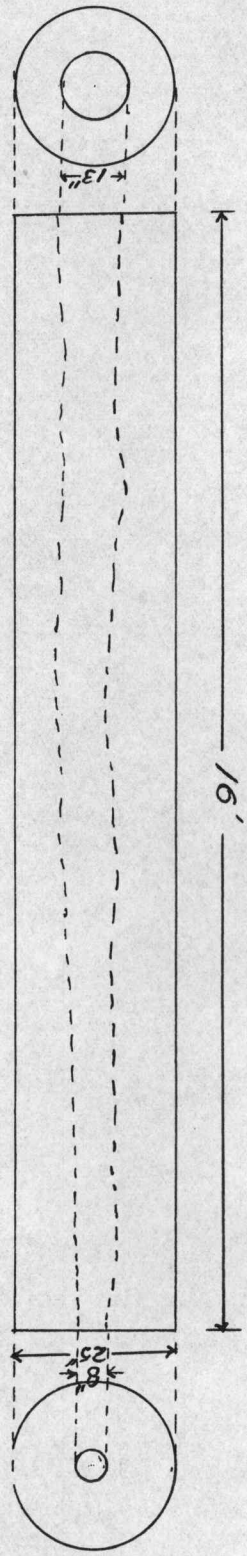
The determination of the defect allowance is the most variable factor in the scaling profession as well as being one of the most difficult. Anyone can scale a sound log but it takes an expert to determine the board foot content of a defective log. A man gains his skill of making deductions through years of constant practice and application.

Making deductions can best be learned around the log deck of a sawmill where one can scale the log and then watch the log cut out.

The kinds of defect in any one region are fairly constant. By constant I mean your butt rot or trunk rot will extend about the same distance into a log in any one region and in another region will extend either a greater or a lesser distance into the logs,but in any one region it will remain fairly uniform.

INDICATORS

The indicators in Port Orford Cedar are very few. A conk on a white cedar is indeed a rarity. The only real indicators are the stains on the end of the logs showing the logs to be in a certain stage of decay. Another is the deformations on any part of the log. These deformations,as a general rule,are indicators of some kind of rot. Then of course there are the many mechanical



H eart or Circular Rot

Plate III

injuries that provide entry courts for the different kinds of wood rotting fungi. In a good many instances one may determine the extent of the rot by sounding the log with an axe.

I will try to give a discourse on the different types of defects and the mechanical injuries that are to be found in Port Orford Cedar and the methods of making deductions for each type.

INTERIOR DEFECTS

HEART ROT

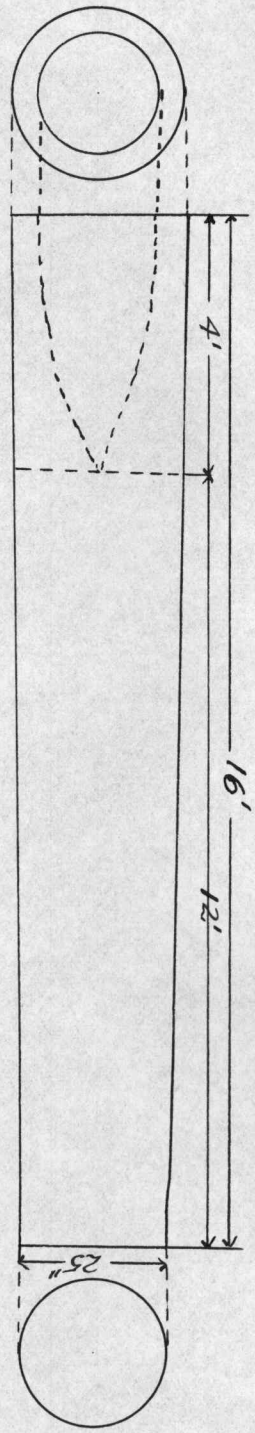
A log is eighteen feet long and twenty-five inches in diameter, at the small end inside the bark. A center rot, extending the entire length of the log and is visible at both ends, is eight inches in diameter at the top end and thirteen inches in diameter at the butt end.

1. Scale the log as sound. According to the Spaulding Rule a log eighteen feet long and twenty-five inches in diameter contains 505 bd. ft.

2. Determine the dimensions of the defect at both ends and average them

13 plus 8 equals 21, divide this by two and it equals 10.5 inches. Round this off to the nearest inch and it gives you 11 inches plus one inch makes it 12.

12 times 12 times 18 divided by 15 equals 170 bd. ft.



Type of Defect Caused by stump rot

Plate IV

3. The net scale of this log will be;

gross -------- 505

deductions ---- 170

net ---------- 335 bd. ft.

By the standard deduction rule one inch is allowed for waste material, by that I mean the unsound material that would be sawed out plus the sound material that would also have to be wasted in order to get the unsound material.

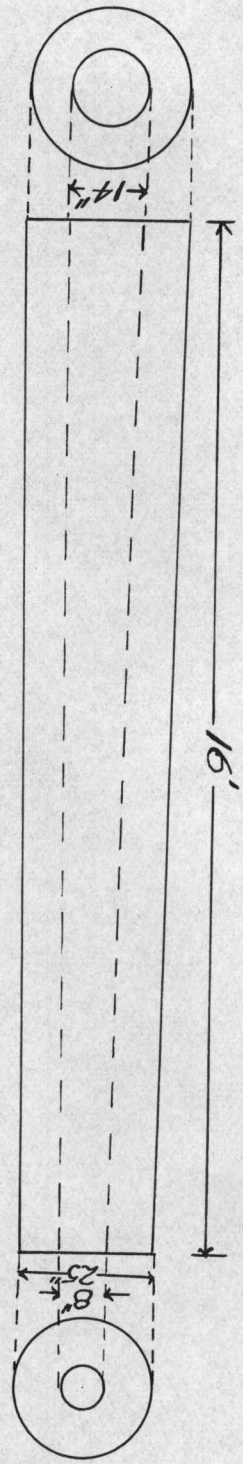
Where the defect shows up in only one end of the log the diameter of the rot at the visible end is taken. T he scaler will then assume the defect to extend half the length of the log and make his deductions accordingly.

BUTT OR STUMP ROT

Butt or stump rot seldom extends far into the log itself usually coming to an abrupt point. When the defect allowance obtained is larger than than a deduction by reducing the length would be, the latter result is taken as the net scale of the log.

For example take a sixteen foot log with atop diameter of eighteen inches, with abutt rot sixteen inches in diameter extending four feet into the log.

The squared defect allowance for this is 70 bd. ft. Reducing the length to a twelve foot log gives a scale of 162 bd . ft., deduct this from 216, the gross scale of the log, and it gives you 54 bd. ft. in contrast to the 70 bd. ft. the squared defect takes away. The net scale of this log will be 162 bd. ft.



Deduction for the Type of Defect Caused by Bark Rings

Plate V

It must be clearly understood that no fixed rule can be established as to the distance that stump rot will extend into a log. In a good many cases as in the case cited the rot of those dimensions would extend more than four feet into the log.

BARK RINGS.

These are the type of defects that appear in and follow the annual rings. Two distinct problems are presented to the scaler depending upon the character and extent of the defect.

1. Where the defect is of such an extent that no merchantable material is contained within the bark ring.

For example we have a sixteen foot log twenty-five inches in diameter with bark rings of eight inches in diameter at the top and fourteen inches in diameter at the butt end of the log and of such a character that no merchantable material is contained inside the ring. The method in this case would be to scale the log as though it had heart rot and make the deductions accordingly.

1. Scale the log as sound with 449 bd. ft.

2. Scale defect as 8 plus 14 divided by 2 equaling 11 plus 1 inch. 12 times 12 times 16 divided by 15 equals 150 bd. ft. to be deducted.

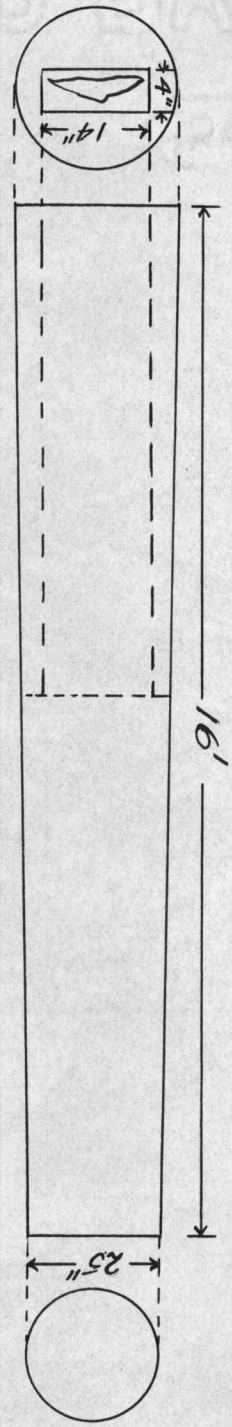
3. The net scale pf this log will be :

gross ------- 449

deductions - 150

net --------- 299 bd. ft.

OLD BADGER BOND
RAG CONTENT



Deductions for the Type of Defect Caused by Heart Check

Plate VI

2. Where the defect is confined to a restricted zone and contains certain merchantable materials.

Consider the same log as before, but suppose the bark ring has ten inches of good material on the inside.

1. The log will be scaled as sound with 449 bd. ft.

2. Determine the defect which was 150 bd. ft.

3. Then find the scale of a sixteen foot log ten inches in diameter which is 50 bd. ft.

4. This 50 bd. ft. is then deducted from the 150 bd. ft. and gives a resulting net deduction of 100 bd. ft.

5.The net scale of this log will be:

gross ------- 449

deductions -- 100

net --------- 349 bd. ft.

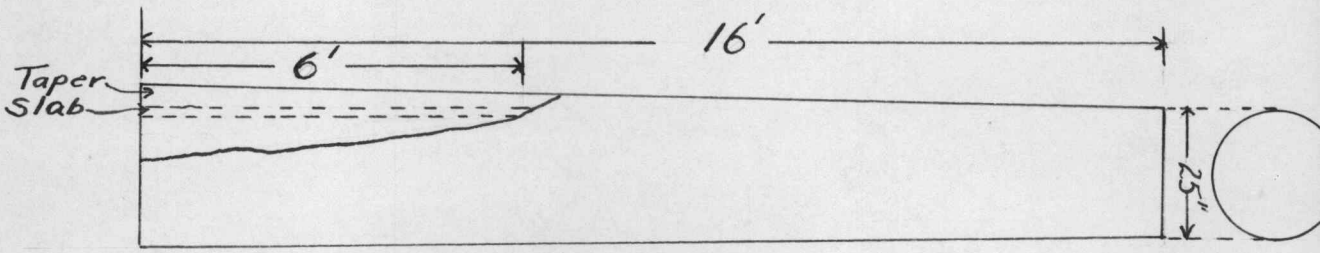
HEART CHECKS

This type of defect follows the medullary rays for the most part rather than the annual rings.

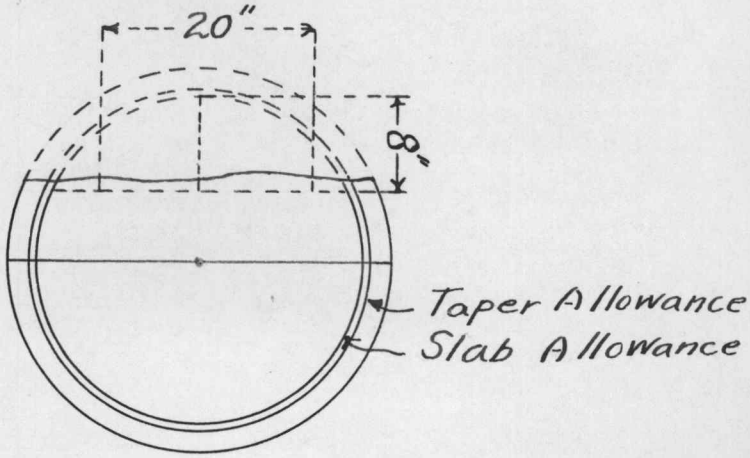
For example take a sixteen foot log , twenty-five inches in diameter with a heart check extending part way across the butt end. This defect from all indications looks as though it would extend into the log about ten feet and is four by fourteen inches in dimensions. The standard deduction rule is then applied.

1. The gross volume is 449 bd. ft.

2. The deduction of 4 times 14 times 10 divided



Deduction for the Type of Defect Caused by Fire Scar



Application of the Standard Rule for
Determining Defect Caused by Fire Scar

Plate VII

15 which equals 40 bd. ft.

3. The net scale is then:

gross ------- 449

deductions -- 40

net --------- 409 bd. ft.

Heart check is often twisted and when it passes clear through the log and comes out the other end at a different angle the deductions will necessarily be increased to take care of the additional wasted material.

SIDE DEFECTS

CAT FACES

A cat face is a fire scar occuring on either end of the log. It is an excellent entry court for fungi and insects.

For example we have a sixteen foot log twenty-five inches in diameter. This log has a cat face on the butt end of the log extending ten feet up the log. The last foot is outside the scaling cylinder. The average dimensions are 11 inches deep by 21 inches wide and 9 feet long.

1. Scale the log as sound with 449 bd. ft.

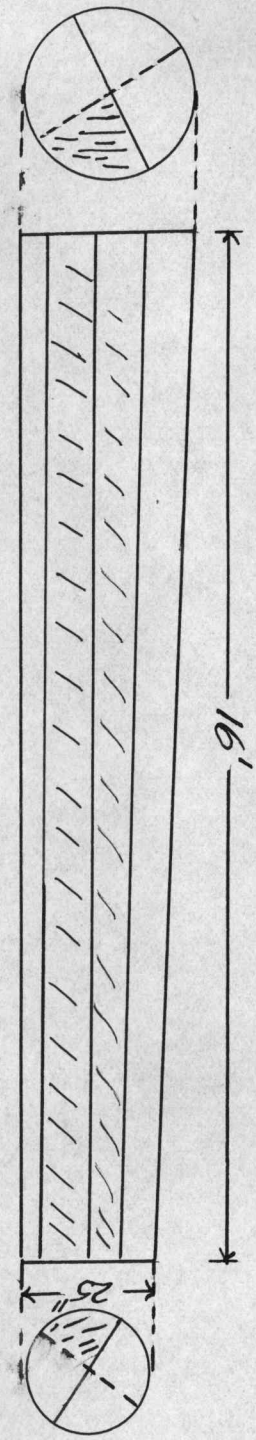
2. Apply the standard rule for deduction which gives the result of 140 bd. ft.

3. The net scale of the log is as foolows:

gross ------- 449

deductions -- 140

net --------- 309 bd. ft.



Deductions for Defect Caused by Lightning

Plate VIII

LIGHTNING SCARS -

During lightning storms many trees are struck by the lightning which follows down the trunk of the tree doing damage to the tree. The seriousness of these defects depends upon the severity of the stroke and its consequent results in lessening the merchantability of the remaining lumber.

For example the scar is such that you may divide the log into segments and by so doing throw the entire defect into one section.

1. We have a sixteen foot log twenty-five inches in diameter containing 449 bd. ft.

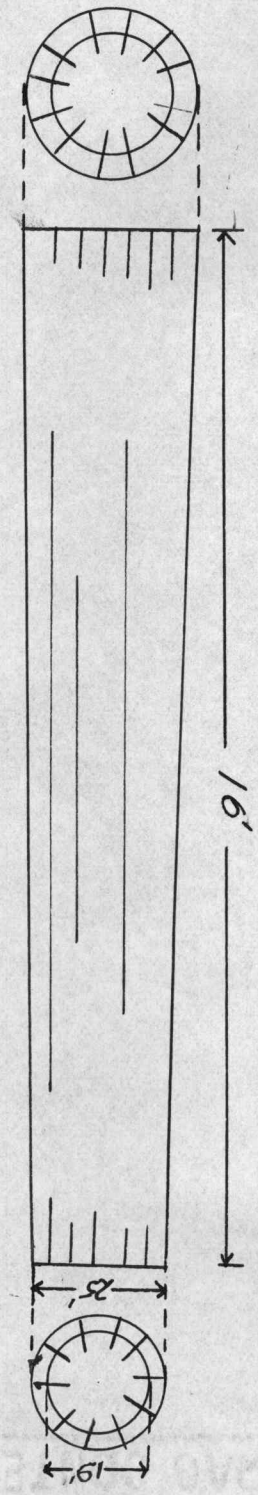
2. The entire injury may be thrown into one of the four quarters of the log.

3. The net scale will be 449 bd. ft. less one fourth the gross scale or making a net scale of 339 bd. ft.

Where lightning streaks spirally clear around the log deductions can be made by scaling the cylinder inside the spiral defect or,if it goes one fourth of the way around the log,by deducting one fourth of the difference between the full scale and the scale of the cylinder inside the defect.

WIND OR SUN CHECKS

The common method for making deductions for wind or sun checks is to take the scaling diameter of the log to be that that would result from dropping in from the edge of the log one half the lengths of the checks.



Deduction for Defect Caused by Sun or Wind Checks

Plate XI

For example we have a sixteen foot log twenty-five inches in diameter with checks extending the full length of the log and six inches in towards the center of the log. By scaling the checks halfway to the center three inches of material is excluded all the way around the log. Thus we now have a log sixteen feet in length and nineteen inches in diameter instead of the original twenty-five inches.

1. The gross scale is 449 bd. ft.

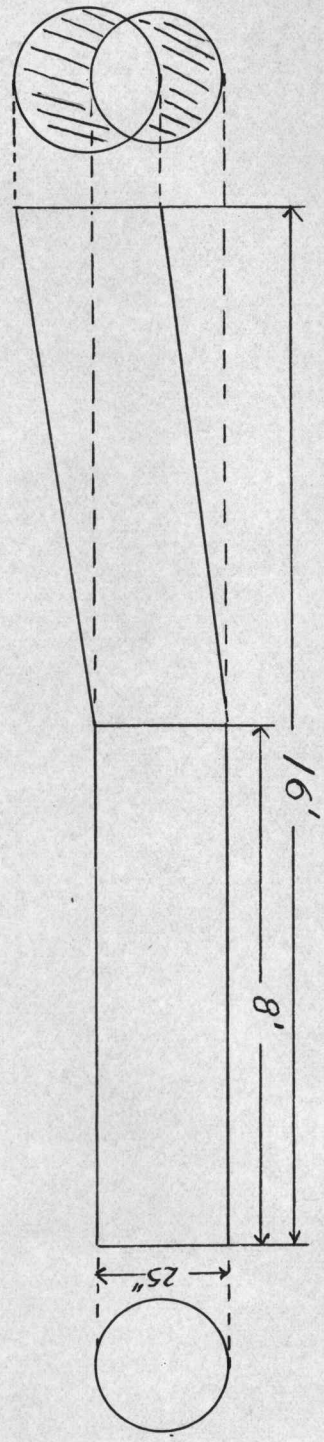
2. The scale of the sixteen foot nineteen inch log is 245 bd. ft.

3. The net scale of the log is 245 bd. ft.

CROOK OR SWEEP

The severity of the defect arising from crook or sweep depends upon the degree of its curvature outside the scaling cylinder. When the sweep is in but one plane it is comparitively easy to handle. In cases where the sweep is in two planes the portion of the scaling cylinder contained in the log becomes decreasingly less and the crook may be so excessive as to reduce the amount of merchantable material below the merchantability standards of one third the gross volume as is set in the Port Orford Cedar Region.

The most common method for the deduction of sweep is to reduce the length of the log in a measure directly proportional to the loss through occurrence of the crook or sweep.



Deduction for Crook or Sweep

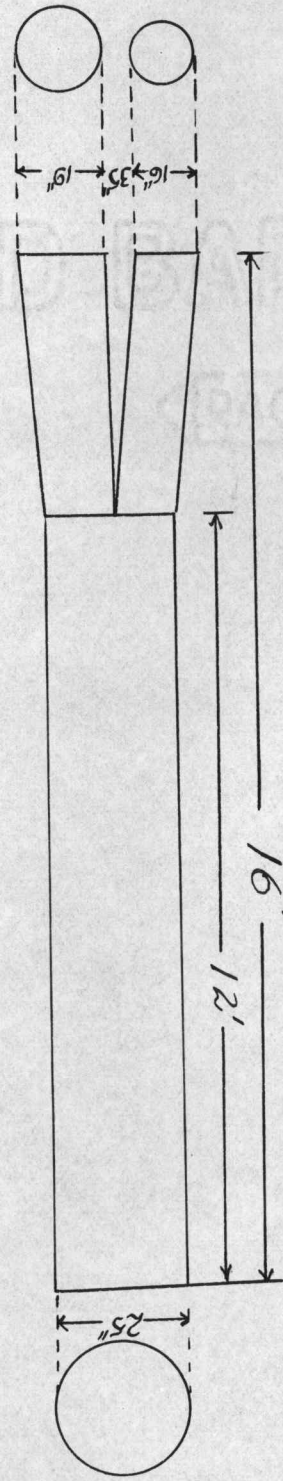
plate X

For example we have a sixteen foot log twenty-five inches in diameter with sweep in one plane affecting only one fourth of the length of the log. Half of the log is not affected and only half of the remaining eight feet is affected. To compensate for the loss in milling this log the last four feet will be deducted. The log is now twelve feet long and is still twenty-five inches in diameter. This gives the log a net scale of 329 bd. ft.

CROTCH DEFECTS

This kind of defect really puts the log marker on the spot. Whether or not the log should have been marked for cutting, above or below the crotch, requires accurate knowledge on his part. It is dependant upon the severity of the crotch, the depth it extends into the log, or whether the extra lumber included in the crotch will pay for the extra labor required in sawing it out. The proper place to obtain the scaling diameter is just below the swelling of the fork. However since such diameters can only be obtained by the use of calipers or a diameter tape it is customary for the scaler to measure the butt diameter and allow for taper to the point of least swell or to the scaling diameter.

If the log is cut very close to the point of departure of the crotch so that little or no end surfaces are broken or appreciably lowered in volume by heavy excess bark or by adeep split, no deduction is made and



Method of Scaling a Crotched Log

Plate XI

the log will be scaled as if of the before mentioned diameter and of a sixteen foot length.

If,however,there is a pronounced crotch with two forks cut off at some point beyond the point of departure from the main stem, care must be taken in determining the proper scaling diameter and other dimensions.

Take for example a sixteen foot log twenty-five inches in diameter with adeep and pronounced crotch at the upper end of the log. The depth of this crotch is some three feet and the forks are rather pronounced. The extreme flair measured from the outside limits are thirty-four inches and the individual diameters of each are an average of about sixteen inches. The average of these two diameters would not give a true scaling diameter. The log is measured below the point of abnormality and found to have a scaling diameter of twenty-five inches. The remaining good material in the log is found to be twelve feet long. The part in the fork is too short to be of any appreciable value so the net scale of the log is that of a twelve foot log twenty-five inches in diameter or 337 bd. ft.

ROTTEN SAP

Rotten sap occurs as a shell around the solid core. The method of determining the volume of the merchantable material inside the sap requires the scaling of the diameter well inside the unsound material. One

inch extra should be deducted from the inside measurements to insure against waste in the milling process.

For example the log is sixteen feet long with a scaling diameter of twenty-five inches originally. This log has a two inch ring of rotten sap around the core. The sound material inside the ring is twenty-one inches in diameter. Less one inch to this and you have a scaling diameter of twenty inches. The net scale of this log is now 276 bd. ft.

BREAKS AND SPLITS.

In scaling broken logs, all breaks or parts of logs necssitating a loss in the production of the lumber of merchantable lengths, must be eliminated in the scale. Broken ends should be allowed for by measuring only that portion of the log that is free from breaks in even foot lengths. Care must be taken that the part scaled represents the actual part of the log suitable for the production of merchantable lumber. When breaks occur in any portion of the log and the waste can be eliminated by a deduction equal the amount of waste caused by the break and the balance of the log is suitable for the production of lumber of merchantable lengths, an allowance for the actual amount of breakage is sufficient. When breaks occur and only short lengths or less than standard lengths can be produced all portions of the log containing the break and the short lengths shall be eliminated from

the net scale.

*The reference for the above material is THE SCALING AND MEASUREMENT OF NATIONAL FOREST TIMBER which is as a general rule known as the scaler's bible. This material was not taken word for word but the rules stated in this reference were used here for this is court of last appeal for scaling practices in the Port Orford Cedar Region.

SYSTEMS OF ALLOWING FOR DEFECTS

"One of the most prevalent variances in scaling is whether deductions are made by reducing the diameter or the length in proportion to the estimated damage done by the defect in the log , or whether they are made by confining the calculations to the defective portions and figuring on a percentage basis in proportion to the gross scale.

The diameter deduction distributes the estimated defect over the entire log and the length deductions involve all of the wood in the part deducted whether it is defective or not,whereas the percentage systems confines the calculations to the defective portion and the sound wood is scaled in full, it is understood that the scaler's calculations in figuring estimates of defective portions are based on such rules as can be practicably applied and that are in general use in the region." 4

"The most accurate method of mathematically reducing the scale for interior defects in logs showing in one or both ends of the log is to treat the defect as sawed out in squares or rectangles. Twenty percent of the square or rectangle inside the inside the slabbed surface is deducted for kerf in the log rule. This deduction is carried in scaling sound logs and therefore should not be included in the allowance for the defect.

The scaler first measures the end dimensions of the square or rectangle which will be wasted in manufacture and determines its length. A slight allowance is made in excess of the dimensions to cover the loss in sound material. This incidental loss,which will be one inch, is added to the actual diameter of the defect to give its total dimensions. From its computed contents in board feet twenty percent is deducted to make the scale rule allowance for saw kerf and the remainder raised or lowered to the nearest ten."5

The above method is known as the standard rule method and is probably the most accurate of any of the methods cited. In actual cases it is not always as speedy as the methods first described in this section. However by the use of deduction sheets containing tables of the various squares and rectangle deductions to be fastened

in the back of the scale book the method is speeded up to such an extent that it may be even faster than the other two methods listed here.

In cases where speed is very essential the scaler often resorts to rules of thumb or memorized deductions for defects of certain sizes that give practically the same results as those obtained by using the deduction tables of the standard rule. The accurate use of these rules of thumb is acquired by the scaler from a wide experience and a trained memory. These rules of thumb should not be applied by the untrained man or by one of very little experience until he has checked them to see just how they compare to the actual deductions when using the standard rule.

CHECK SCALING

By check scaling is meant the re-scaling of selected logs or of a portion of a total run of logs to determine the relative accuracy of the original scale, by checking the methods used by the scaler, and to detect and correct errors in the original scaler's methods. A re-scale is determined by the re-scaling of allt he logs in a run. The necessity for a re-scale is determined by the results of the check scale.

When a number of scalers are employed by a company check scaling becomes a necessity in order to maintain uniform scaling practices. No matter how carefully the standards of scaling practices are set down in printed material which cover not only the "scale" with respects to the diameters, lengths, taper, and trim allowance, but rules for the deductions of defects, the scaler tends to vary through habit or carelessness and inexperienced men are slow to acquire accuracy, especially in defective timber.

The check scale should be made by the most experienced man available and as frequently as is possible. With a good many scalers in the field this job becomes large enough to require a scaler on it at all times. Where thescale is stamped on the log itself the check scaler has little trouble in comparing the two scales without recourse to the original scale sheets for the run of logs. The check scaling should be done under as nearly the same

conditions as the original scale as is possible,to give the two scalers equal chance in the making of their deductions and the determination of the final result.

Using the check scaler as a basis of one hundred percent the percentage of error in scaling is easily computed for a run of logs. The two scales should check within the following percents:

> "For sound logs ---------- within one percent.
> Logs up to ten percent defective " two "
> Logs eleven to twenty percent defective --------
> within three percent.
> Logs over twenty percent defective ----------
> within five percent."6

Check scales are made for the purpose of correcting the scaler,but not as a basis for altering the scale. Only in cases where the original scale is shown to be decidedly in error,so as to work a hardship on either party concerned,is the scale ever altered.

Scalers should not be reprimanded in general terms for scaling too low or too high. The result is usually a worse error in the opposite direction. The scaler should be checked on the individual logs in an effort to determine just what he has been doing wrong with the purpose in mind of correcting that particular fault in his scaling. This will not then affect his scaling in other types of defects.

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SUMMARY

I believe that the scaling practices in th Port Orford Cedar Region differ from those in other regions in that the scaling is done in this region on a quantity basis rather than on a quality basis. By so doing I believe the results of two scalers on the same group of logs are more standard than they would be if these same two scalers also had to watch for quality as well as quantity.

In scaling in the Port Orford Cedar the scaler finds that he has very few if any external indicators to tell him of the extent of the rot in the log. Conks on white cedar logs are very rare. The scaler must therefore exercise more judgment and be a man of greater experience than the scalers in some of the other regions. I believe that the judgment of the scalers in this region is a little more educated from a greater constant use than is the judgment of scalers in other regions.

In this region all defect allowances are made in strict accordance with the standard deduction rule of the United States Forest Service. As I have explained in the text of this paper, this calls for taking a squared timber from the center of the logs or from the area around the defect. This rule has been scientifically compounded and a great deal of research and time has been put in on the study of defect allowances with the standard rule

as the result. In my opinion this rule is only logical and fair. I don't think the manufacturer should be made to pay for something he cannot use.

I have tried to write this paper in terms easily understandable to all interested enough to read this. The few technical terms that I have used have been explained as fully as possible. The original purpose of this paper was to give the reader, unfamiliar with the subject, a sufficient idea of the magnitude and importance of the scaler's job,also I have tried to give some inkling as to the practices and customs followed in this region.

In some of the topics or divisions I may have strayed away from the main purpose of this paper, but if this paper has in any measure fullfilled the above purpose I will be well satisfied. I now leave it to your judgment.

THANK YOU