AN OUTLINE FOR LOGGING
AN EXPERIMENTAL WATERSHED
IN THE ROCKY MOUNTAIN REGION

Submitted by
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Lawrence V. Monninger

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INTRODUCTION

Foresters, farmers, stockmen, city dwellers, and other groups interested in and dependent upon water have been vitally concerned with the problem of conserving and increasing the supply of good water from our mountain watersheds. For this reason, the Rocky Mountain Forest and Range Experiment Station has instigated investigations in order to discover the means by which this important resource can best be managed. One of the areas now undergoing study is located on the Fraser Experimental Forest near Fraser, Colorado. (See Figures II and III.)

As a part of this study, a pair of watersheds, Fool Creek and East St. Louis Creek, have been set aside to determine the net influence of timber cutting on water yield. (See Figure I.) The timber on the Fool Creek watershed is to be cut in the manner found to be the best for the maximum snow storage and the maximum water yield compatible with high water quality, low erosion liability, and good silvicultural practices. (20) It is to this watershed that the contents of this paper are confined.

The purpose of this paper is to present the preliminary problems involved in preparing an experimental watershed for cutting and to prove that the logging of Fool Creek could best be accomplished by a cable system. It is also the objective of this paper to present some of the

Figure I. View of the paired watersheds -
Right: East St. Louis Creek
Left: Fool Creek

Figure II. Beyer's Peak, which is on the southwest boundary of the Fraser Experimental Forest.

problems involved in logging a watershed to obtain the maximum water yield. To this end, the first part of this paper will be devoted to a short discussion of the preliminary work that has been done, the scope of the experiment as a whole, and the timber surveying and mapping of Fool Creek. The cutting and logging plans, suggested procedures for logging, and a cost and time comparison for horse logging and cable logging will follow.

It is hoped that the material and ideas presented in this paper shall prove of value to anyone desiring information concerning watershed surveying, cutting, and logging. However, this paper is especially dedicated to those who are interested in the possibility of cable logging in the Rocky Mountains.

I

GENERAL ASPECTS OF THE STUDY

I

GENERAL ASPECTS OF THE STUDY

Objective

The objective of this portion of the paper is to present the general aspects of the watershed experiment as a whole. Most of the discussion will be confined to the Fool Creek watershed, however, for it is on this watershed that the logging is to take place. The timber of Fool Creek is to be cut in order to determine the net influence of timber cutting upon water yield, and it is hoped that the results, if significant, and as free as possible from extraenous factors, may be applied to similar watersheds in the vicinity. Since the forested areas of the Rocky Mountains are valuable primarily as watersheds, any method of increasing the quantity, without decreasing the quality, of the water coming from these forests is of great economic importance to the region as a whole.

Location and Description

Both watersheds, Fool Creek and East St. Louis Creek, are tributaries to St. Louis Creek, on the headwaters of the Colorado River. The lower parts of both watersheds (below the gaging stations at about 9500 ft. on Fool Creek and 10000 ft. on East St. Louis Creek) were selectively cut over about 30 years ago.(20)

The general flow of both streams is generally north; exposures, cover, and topography being very similar. The

Figure III. Headquarters building, Fraser Experimental Forest

Figure IV. Weather Station on West St. Louis Creek.

underlying rock formations are composed of granites and variously metamorphized intrusions. Some remnants of sandstones are to be found in certain areas. Soils in the stream bottoms are gravelly and deep - probably deposited by glaciers. Soils in the other portions of the watersheds are shallow, gravelly, and rocky (20)./[1]

The timber types on both watersheds are lodgepole pine and Englemann spruce-alpine fir. Evidence obtained from the timber survey on Fool Creek seems to indicate that the total areas of both types are approximately equal on this watershed. However, this may not necessarily be true on East St. Louis Creek. Since much of the spruce-fir type of Fool Creek is stunted and defective near timberline, however, there is no doubt that lodgepole pine will constitute the major portion of the volume cut on Fool Creek.

Past Work

Studies of water yield from controlled watersheds have been among the first investigations made in forest influences. Watershed studies in Switzerland, France, Germany (8); and in the United States in Colorado (1) (6), southern California (2) (3), Idaho (5), Utah (17); and in many other locations (7) (8) (9) (10) (11) (12) (15), have shown that denudation or partial removal of the vegetation

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/[1] A more detailed study was completed during the summer of 1948, and the results will be available in the near future.

Figure V. M-7 Snow tractor

Figure VI. Spruce-fir type near the Fool Creek Gaging Station

has greatly increased water yields. In line with this subject, the Rocky Mountain Forest and Range Experiment Station has instigated, within the last ten years, studies pertaining to the effect of timber cutting on water yield, interception, and snow storage. (16) (18) (19) Also, a study concerning the influence of climatic factors (primarily wind) on snow melt (see Figure IV) has been started in cooperation with the Bureau of Reclamation (20)./[1] All these investigations will play a part in the paired watershed experiment described below.

Scope of the Experiment

Previous experiments have shown that by cutting stands of mature lodgepole pine the amount of precipitation entering the soil can be increased (14) (16)(18) (19). Streamflow, which is directly influenced by precipitation, should therefore be influenced by timber cutting.

To discover to what extent this is true, two adjacent watersheds, Fool Creek and East St. Louis Creek, were chosen for the experiment. Only the Fool Creek watershed (709 acres) will be cut over. St. Louis Creek watershed (2000 acres) will serve as a check. Permanent gaging stations were installed on both of these streams (Fool Creek- 1940; East St. Louis Creek- 1943). (See Figures VII and VIII.) Four ground water wells were also installed on

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/[1] Views of the Bureau of Reclamation's M-7 snow tractor may be seen in Figures V and VI.

Figure VII

Fool Creek Gaging Station

Figure VIII

Entrance to flume at the
Fool Creek Gaging Station.

Fool Creek, in order to provide a means of measuring the seasonal ground water fluctuations. (16)

A permanent snow course on Fool Creek was established in order to measure the precipitation. This consisted of 100 snow stakes and 14 gages distributed along the course so that the entire watershed could be sampled. (See Figures IX and X.) An additional recording intensity rain gage was installed near the stream gaging station to determine the times of occurrence, the intensity, and the number of rainstorms. During the winter, this gage, as well as the others, is used as a storage gage to determine the net snowfall - no attempt is made to measure the intensity of snowstorms. At two week intervals during the time snow cover remains, the storage gages are weighed and snow samples are taken near each snowstake. After the disappearance of the snow cover, and as soon as it is reasonably certain that freezing will not occur regularly, the storage gages are converted to rain gages, and measured weekly throughout the summer.

A modified snow course without gages was established on East St. Louis Creek. A recording intensity raingage and an 100 inch storage gage were set up near the stream gaging station to determine the amount of precipitation. The snow course is read only once before the spring snow melt starts; the storage gage is measured once a month; and the intensity gage visited weekly.

Figure IX

Measuring the snow depth and water content at snow stake No.52 on the upper part of Fool Creek.

Figure X

Measuring snow depth and water content on the steepest section of the Fool Creek Watershed. Note snow-storage gage.

A period of calibration on Fool Creek was necessary in order to get a constant relationship between precipitation and streamflow. A great deviation from the average occurred in 1945, so it has not yet been determined whether or not the period of calibration (8 years to date) has been long enough.(16) However, if by the end of 1949 it is assumed to be satisfactory, and if the access road has been completed, logging will probably commence on Fool Creek in 1950.

This cutting will take the form of methods found to be optimum on mature lodgepole pine plots as well as on mature spruce-fir plots located elsewhere on the Experimental Forest. (14) (18) (19) In this phase of the experiment, forest management will cooperate closely with forest influences in determining the exact methods to use in certain parts of the watershed.

After the logging operation is completed, another period will be required to determine the exact relationship between precipitation and streamflow. At the end of this period, results will be analyzed and a report made.

Although no definite plans have been made, other treatments of Fool Creek may follow - clear cutting, thinnings, and possibly prunings - in order to discover the effects of each upon streamflow. In other words, the present experiment will by no means end the investigations that may be made on Fool Creek. Such experiments may con-

tinue for an indefinite period.

Status of the Study

The stream gaging station on Fool Creek has been in operation for 8 years, and records of precipitation have been collected on the same watershed for a like period. Data for precipitation and streamflow on East St. Louis have been collected for 6 full water years. These records have been compiled and analyzed. Hydrographs for the Fool Creek watershed have been drafted and analyzed with respect to both spring snow melt and summer rainfall. (16)

In order to obtain more accurate figures for gross precipitation on Fool Creek, it was necessary to cut the timber for a radius of 50 feet around every other snow stake. This was done during the third year after the establishment of the course. (16)

All mapping (including a boundary survey, establishment of a north and south base line, and a topographic survey) and timber cruising was completed during the summer of 1948. A combination type map and topographic map was then drafted. A discussion of this work will follow.

During the summer of 1948, a private airplane pilot from Granby, Colorado, was employed to obtain aerial photographs of the two watersheds since the available photographs taken in 1938 were too old to be of any use. The results of this photographing were far from satisfactory because of the airplane's low ceiling. However, a tenta-

tive contract has been let to a pilot who will be able to fly high enough to obtain satisfactory photographs. The flight will probably take place during the spring of 1949 whenever weather conditions permit.

These photographs should prove invaluable as a means of comparison before and after the treatment of Fool Creek. If periodic photographs are taken of the area as treatment, recovery, and further treatments progress, considerable information can be obtained.

II

THE TIMBER AND TOPOGRAPHIC SURVEY OF FOOL CREEK

II

THE TIMBER AND TOPOGRAPHIC SURVEY OF FOOL CREEK

This survey was conducted during the summer of 1948, requiring about five weeks for its completion. Data compilation began soon after the commencement of the field operations.

Objectives

1. The main purpose of the survey was to map the cover types and determine the volumes of merchantable timber on the watershed so that definite treatment plans could be made.
2. The secondary objective was to obtain as accurate a topographic map as possible showing the drainage pattern of the watershed.
3. The last objective was to map in all the important installations on the watershed - the stream gaging station, the snow course, and all snow stakes and rain gages.

Field Procedure

The boundary stakes and strip-marking stakes were used for control./[1] The base line running north and south through the approximate center of the watershed was divided into 16 strata with four randomly chosen cruise strips

/1 Mr. Hugo Niemi, a student at Michigan State College, assisted in the survey.

(running east and west to either boundary of the watershed) within each stratum. Two of these cruise strips were directed to the eastern boundary and two to the western boundary of each stratum. Thus, out of 64 cruise strips, 32 were on the eastern side of the base line and 32 on the western side.(20)

The cruise was started at stake 1-1-W/[1] on the base line, and a strip one-half chain wide, in segments of two chains (when possible), was run to the western boundary. The head chainman, as well as being compassman, tallied the trees as they were called off by the rear chainman. A ten-foot bamboo pole, marked so as to be clearly visible, was set up against the tree over 9.5 inches dbh that stood nearest to the compass.

The rear chainman, after calling "chain" when the compassman had gone forward for 2 chains, took a shot with the Abney level and recorded the chainage and Abney reading in the tally book - also mapping in any type lines, trails, streams, or other points on the Forest Service form provided. (U.S.D.A. 878) As soon as the head chainman had set up the compass, leaned the 10 foot pole against the nearest merchantable tree, and filled out the tally sheet headings, the rear chainman called off the species, dbh,

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/1 1-1-W is the first (1) strip within the first (1) stratum directed to the western (W) boundary.

and crown classification (by use of Taylor's crown vigor classification for lodgepole pine) of all trees within one-quarter chain on both sides of the chain. Upon approaching the end of the two chain strip segment, he measured the height of the tree (chosen by the head chainman) by means of a Chrysten Hypsometer and the ten-foot pole. This height was recorded in the appropriate column on the tally sheet by the head chainman.

As soon as all trees were tallied on the strip segment, the compass was adjusted and a new strip segment begun.

At the boundary line, after checking the position of the end of the strip with the nearest boundary stake, an offset was made to a position indicated by the point of intersection of the next cruise strip with the boundary line. (Measurements were obtained from field maps copied from the boundary survey map onto U.S.D.A. 878.) That cruise strip was then run in the same manner as the first, the strip ending on or near the stake marking that strip on the base line.

The crew then proceeded to the stake marking the start of strip 1-1-E and proceeding in the same manner on the eastern side of the watershed. This procedure was followed throughout each stratum and up to the southern end of the watershed. All type changes were recorded,as far as was feasible,on the full chain mark,and all pertinent points

were mapped in as accurately as possible. (See Figures VI and XI)

A separate tally sheet was used for each strip segment or fraction thereof. Types were delineated on the basis of the forest appearance, and an effort was made to make any corrections by later examination of the tally sheets. Frequently, it was extremely difficult to determine the exact line of demarcation between two types. However, the cruise data seem to support the fact that decisions in the field were essentially correct.

Office Procedure

1. Mapping:

The work of drafting all contour lines and completing the other aspects of the map was started about the first of August, 1948, as soon as the cruise had progressed into stratum 4. Considerable data had to be worked up before any progress could be made toward putting the actual contour lines on the map itself.

The true altitude was found for each compass setting on each of the cruise strips and recorded in the field book. The total chainage was 1419.93 chains, so approximately 700 computations had to be made. Since the altitudes at the ends of each cruise strip seldom coincided with the altitudes obtained in the surveys of either the base line or the boundary line, weighted ad-

Figure XI. Spruce-fir type near snow-stake No. 51.

Figure XII. Weatherbeaten spruce crowns near timberline, east side of Fool Creek Watershed.

justments were made throughout the strips so as to distribute the error in proportion to the amount of change in altitude in each strip segment. As the true altitudes for each "compass setting" were computed, they were noted on the map in their respective places along the cruise strips.

As the field work progressed, all streams, trails, snow stakes, rain gages, etc. were transferred from the field maps (U.S.D.A. Form 878) to the large control map by means of caliper measurement. It was assumed that this method of transfer was in keeping with the accuracy of the field mapping.

As soon as the field work on the survey was completed, all work on the map was brought up to date and the contour lines were drawn in at 25 foot intervals. Interpolation was done by eye, and adjustments were made to smooth out the curves. Where a considerable gap between cruise strips on the same side of the base line existed, there was little or no control. In such cases, no attempt was made to draw the contours in accurately. Aerial photographs were used to get the general form of the topography and the contours were drawn in to approximate the general land surface. (See aerial photographs in Appendix.)

Occasionally, it was impossible to close certain

of the type lines while in the field. Aerial photographs were again used to determine the approximate location of these type lines, the boundaries between types being drawn in on the map to conform closely with the type lines seen under the stereoscope. (See Map No.1.)

A copy of the final map was used to plan the cutting for the watershed. (See Map No.2.)

2. Cruise data:

Compilation of cruise data was completed January, 1949. These data were summarized by strips, and placed on the map so that it could be easily studied in relation to the topography, types, and adjacent data. (See Map No. 1.)

After all the volumes for each strip segment in each strip were placed on Map No.1, the line separating merchantable timber from unmerchantable timber was drawn. The position of this line was determined by the plotted volumes and a knowledge of ground conditions. During the actual survey, an ocular estimation of this boundary line was plotted on the field map. Since the volumes were calculated on the basis of the volume on the entire watershed, the volumes noted for the timber in the upper section of the watershed are exaggerated. The trees in the upper section of the watershed were short but with large diameters-- often with butt-swell,

spiral checking, and frost checking. (See Figures XII, XIII, and XIV.) For this reason, considerable reliance was placed upon observations in the field, and only minor adjustments were made in the merchantable line drawn on the original map.

After this merchantable line was established, the merchantable area was found by planimetering the unmerchantable area and subtracting it from the total area. A merchantable area of approximately 550 acres was found.

The average merchantable volume per acre was then computed for each strip, using only the sections of the strips within the merchantable area. These average volumes per acre can be found noted on the map at the ends of each strip within the merchantable limit. The average volume per acre for the merchantable area on the watershed was then calculated. This was found to be 11,750 ft. b.m. per acre. Thus, the total merchantable volume for the 550 acres of merchantable timber on the watershed would be 6,462,500 ft. b.m.

This step was essentially the last in the compilation of the cruise data as it applied to this study. Additional information will be obtained concerning advance reproduction, basal area, etc., before the actual cutting is made. These data will also be valuable in

Figure XIII. Spruce-fir type near merchantable line.

Figure XIV. Spruce-fir type above the merchantable line.

an analysis of the effects of timber cutting after the watershed is cut over.

III

THE CUTTING AND LOGGING PLANS

III

THE CUTTING AND LOGGING PLANS

A. The Cutting Plan

In previous studies on the mature lodgepole pine and on the mature spruce-fir plots it was found that approximately the same increase in snow storage was obtained by either cutting in alternate strips or by cutting in groups.(4)(13)(18)(19) Because of the difficulty involved in logging by groups, it was decided to plan the cutting for Fool Creek by the use of the strip method.(21)(22)

In the above-mentioned experiments, strips one chain wide were used. However, it is believed that strips two or more times this width would be more effective in increasing snow storage.(22) As Fool Creek runs more or less north and south, it was thought that if the strips were located approximately east and west, little increase in the rapidity of snow melt would be obtained.(21) Also, from the logging standpoint, most of the strips would then be located at more or less right angles to the topography. This orientation would be advantageous regardless of the type of logging system employed.

As will be noted on Map No.1, only the relative volumes for lodgepole pine and Englemann spruce were noted above each strip segment. Since alpine fir constituted less than 4 per cent of the total volume on the watershed (much of

which lies outside the merchantable limit line), it was deemed unnecessary to consider this species separately. However, it is accounted for in the volume summations for each strip and each strip segment. In logging, the alpine fir will necessarily have to be cut heavily to prevent domination of the subsequent reproduction by this species. Even though the alpine fir is an excellent species for high altitude watershed cover, its inferiority as a timber species makes it undesirable. Therefore, it should be taken out whenever possible so that the Englemann spruce and lodgepole pine will constitute the main portion of the subsequent stand.

In planning the areas to be cut, strips 150 feet wide were employed.(22) As far as was possible, this width was kept constant throughout the length of each strip. Also, an attempt was made to locate each strip so that its long axis was oriented more or less east and west.

Deviations from this rule may be found on parts of the watershed. However, the strips that approach a north and south direction are located on north-facing slopes. The rapidity of snow melt on these strips should approximate that on the strips approaching an east and west direction.

Because of the prevailing north and south winds, there is little doubt that more windfall will occur on the north-south strips than on the east-west strips.(22) However, it will

be noted that the north-south strips are more or less protected on three sides by higher ground and that these strips were kept as short as possible to cut down on the amount of the residual stand subject to wind damage.

Also, these strips were placed so that the varying degrees of protection afforded by the residual stands and the surrounding topography could be evaluated in future surveys following the cutting. If strip logging of our mountain watersheds proves to be of value in increasing the water yield and if such a method of logging is adopted, a knowledge of the damage due to windfall in relation to the strip direction will be valuable. In addition, it is obvious that in the particular areas in which these more or less north and south strips are located, logging will be greatly facilitated. For these reasons, and for the reasons outlined in the preceeding paragraphs, it would seem that much information will be gained by locating certain of the strips in such a direction, even though it is contrary to the accepted cutting procedure based on established watershed cutting techniques.

All strips will be "commercially clear cut"; that is, all trees over 9.5 inches dbh will be cut.[22] In addition, it may be advisable to remove concentrations of alpine fir regardless of size. However, this will be decided upon later, and has little bearing on the overall cutting plan.

Approximately fifty per cent of the volume should be removed.[21][22] Since the strips proposed would be 150 feet wide whenever possible, the residual stand would also be in the form of approximately 150 foot strips. However, in the construction of the logging plan, it was necessary to vary the widths of the strips of timber to be left rather than the strips of timber to be cut whenever such a move was indicated, in order to conform with the requirements of the logging system proposed.

To cut down erosion hazard, all skid trails and spur roads should be ditched and brushed in after the area served by them has been logged.[22] This requirement will necessarily impose a large burden upon the logging operator if much road construction is required and if a great number of skid trails are needed.

Damage to the reproduction already on the watershed should be kept at a minimum. It is well known that in many logging operations, as much as 75 per cent of this advance reproduction is damaged.[22] Excessive destruction of reproduction should be guarded against in the logging operation. For this reason, a minimum number of skid trails should be used, and skidding through the strips of residual trees should be avoided.

Since further refinements of the cutting plan are necessarily dependent upon the system of logging employed,

further discussion will be found in the section on the logging method which follows.

B. The Logging Plan

In attempting to analyze the problems of logging Fool Creek and in an attempt to satisfy all the requirements imposed upon this logging, it was necessary to approach the situation from quite an objective angle. In order more clearly to understand the problem, it might be well to restate the following restrictions:

1. To obtain the maximum snow storage without increasing the early spring snow melt excessively and to keep windfall at a minimum, all strips should be located in as near an east-west position as possible.
2. To keep erosion at a minimum, these strips should be located so that the skid trails on the strips would not create a high hazard.
3. Damage to advance reproduction should be avoided.
4. The number of spur roads and skid trails should be limited; and they should be as short as possible, since they will have to be ditched and brushed in as they are abandoned.
5. Skidding through the strips making up the residual stand should be avoided.
6. All skidding, insofar as possible, should be at right angles to the topography -- as side-hill skidding is im-

practical in most areas.

7. A permanent access road with a maximum grade of 7%, is being constructed by the U.S. Forest Service to serve as the main logging road. The location of this road will determine the location of any spur roads.
8. Because the intended cut is approximately one-half of the total volume, or nearly three and one-half million board feet, the investment in the operation should be kept as small as possible.
9. Finally, to facilitate the experimental work, logging should be completed as quickly as possible.

The problem outlined above was submitted to several authorities in this region in an effort to discover the general concensus concerning the best method to use in logging Fool Creek. Because many of the restrictions given above are adverse to the prevailing logging methods in the Rocky Mountain region (which are either horse or tractor logging), many of these individuals expressed the opinion that some form of cable or power logging could be used to advantage. However, the main objections to cable logging--high investment, destruction of advance reproduction, and the sharp deviation from accepted practice -- seemed to work against the use of this method. Nevertheless, its disadvantages seemed to be outweighed by the following advantages.

1. If some form of skyline system were to be used, topography would not be a limiting factor on Fool Creek.
2. Each of the strips, being 150 feet wide, could be logged in one setting.
3. The numerous skid trails needed with horse logging could be eliminated because all skidding could be confined to one skid trail per strip - directly under the skyline.
4. Because of this elimination of a great number of skid trails, advance reproduction should not be damaged excessively.
5. Tree-length logs could be handled, eliminating bucking in the woods. All bucking could be done at the landing.
6. The number of spur roads that would need to be constructed would be about one-fourth or one-fifth of the number required by a horse skidding operation.
7. Skidding through the strips of residual stand would be eliminated.
8. Uphill skidding, downhill skidding, and side-hill skidding could be done easily by some form of skyline system without loss in efficiency.
9. The access road now being built would be an asset rather than a hindrance if a cable system were to be used, because horse logging demands that spur roads be

built under the areas to be cut. Since this access road is routed above much of the timber, many more miles of spur roads would have to be built in order to avoid uphill horse skidding.

10. Logging could be conducted at a much faster rate with a cable system than could ever be approached by a horse-skidding show.

11. Finally, the fixed investment could be kept at a minimum because only light equipment would be needed for the relatively small timber found in this region. This equipment could be chosen so that no specialized items need be purchased - all could be used for other purposes as well as cable logging.

For the above reasons, it was decided to plan the logging of Fool Creek using some form of cable logging system involving the use of a skyline. Since the skidder system, Tyler system, and slack line systems would be too elaborate and would involve considerable investment; and because a high lead system would destroy too much reproduction, the Northbend system seemed to be indicated. (See Diagram No.1.)

The Northbend system could be operated efficiently by a double-drum tractor approximately of D-6 size (drawbar H.P. about 65). Small sized cable could be used because of the relatively small-sized material being yarded.

FOR INCREASING LIFT

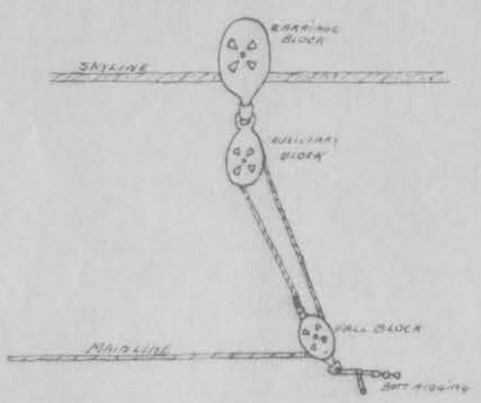
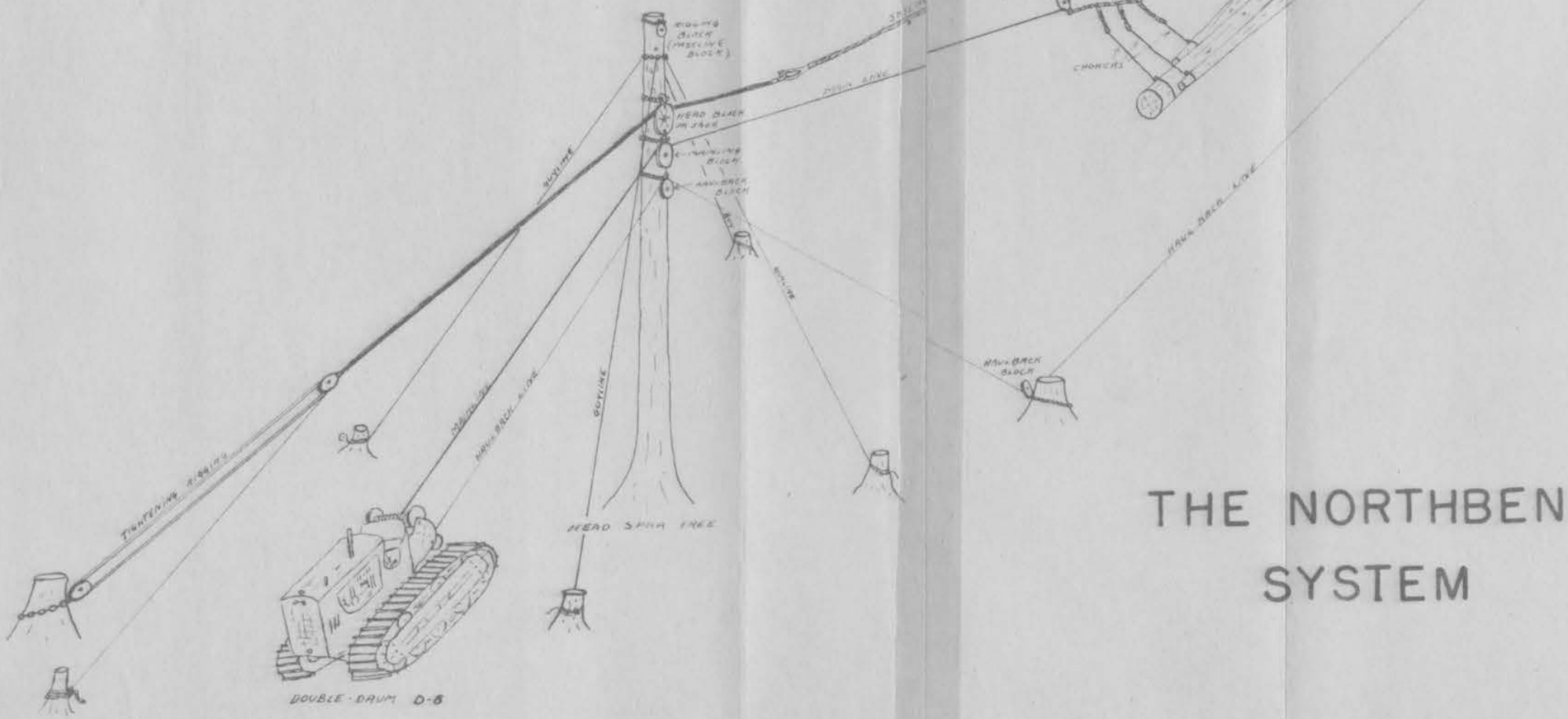


DIAGRAM NO. I



THE NORTHBEND SYSTEM

Small blocks could also be used for the same reason and no specialized equipment would be needed. The number of men needed for the operation would be small, and all rigging and yarding operations could be conducted on an efficient basis by an inexperienced crew.

A suggested method of logging procedure, a list of men and equipment needed, and a rough cost comparison between this system and horse skidding may be found in Part IV and V.

It is to be admitted at this time that the costs per thousand board feet will be high on Fool Creek, especially if all new equipment has to be obtained. If such a system were used elsewhere on a larger operation, however, the advantages gained in the saving of time, the saving of costs for spur road construction, and many intangible savings, would make this method of logging more practical for this region than horse logging. It is the purpose of this discussion not to recommend this method, but to present the problem in such a manner that individuals with more experience may be able to analyze its possibilities and form their own opinions regarding its feasibility. However, since all the problems involved in using a cable logging system in this region cannot be anticipated and accounted for, an actual demonstration of its possibilities will have to be conducted. It is the hope of this writer that such an experiment may be undertaken and

that this discussion and analysis will prove of value to anyone contemplating such an operation.

Mapping the Logging Strips

As soon as the plans for cutting and logging were formulated, the locations of the strips to be cut were plotted on a copy of the topographic map of Fool Creek. All type lines were also transferred to this map.

As has been outlined previously, in the section on "Planning the Cut", it was very difficult to plan the locations of the strips so that all the cutting requirements could be satisfied. As was noted, several strips approach a north-south direction rather than east-west. The reason for this action has been discussed.

In the planning of the logging, it was realized that even though a cable system of logging was to be used, such a system has its disadvantages. The Northbend System, being a skyline system, is limited because of this fact. Trees chosen for spar trees must have fairly large diameters and be firm. Since the topography will determine just how high the skyline blocks will have to be hung, the heights of these spar trees may vary according to the requirements for each set. Rough Abney level shots would readily determine just how long a strip may be without allowing the deflection in the skyline to bring it too close

to the ground. It must be remembered that in order to keep the logs free of obstructions on the in-run, the front of the logs must be elevated. Hang-ups rapidly eat up profits when they occur too often.

As can be seen on Map No.2, it was difficult to arrange the sets so that topography would not interfere with the cable system. At times, it was necessary to indicate that horses may have to be used to cold deck the logs near the tail spar whereever "blind spots" occur. The cable system would then be used to swing the logs the rest of the way to the nearest road. Also, where it did not seem necessary to use the cable system (on short hauls, in corners, etc.), the use of horses is recommended.

All spur roads were planned in reference to the main logging road, the approximate location of which has already been established. Revisions of these locations will no doubt have to be made as actual road construction is started. However, a comparison of these roads with the roads required with a horse-skidding operation can easily be made.

Although the Northbend system may be used on sidehills, it was felt that if the system were used indiscriminately on all side hills, a considerable amount of damage would be done to the advance reproduction. Logging on steep side hills would cause the free ends of the logs

to drag downhill resulting in a wider skid trail than would result if the logs could be trailed directly under the skyline. For this reason, side-hill logging was avoided whenever possible, and the strips were run at approximately right angles to the topography. It is believed that by logging directly uphill, directly downhill or on only gentle side-hills, the operation would be more efficient and far less damage to the reproduction would result.

As has been previously stated, all spur roads and skid trails should be ditched and brushed in after logging.

Slash burning along the roads should also be required to cut down fire hazard and to facilitate skidding and loading.

It is estimated that 1100 actual logging hours will be required to log Fool Creek. This does not include road building, bucking at the landing, decking, or loading. If such a cable logging system is to be used, it must be remembered that if the operation is to be run efficiently, all cutting, limbing, bucking, decking, trucking, and even road building must be geared to the speed of the yarder. If such a schedule could be maintained, all logging on Fool Creek would be completed within 200 6-hour working days - or roughly 10 months. This estimate allows for considerable loss in working time due to adverse weather con-

ditions, equipment breakdown, etc. This tentative time would be of use only to those who wish to estimate the approximate time required to do the logging by their own methods. A more exact comparison between horse skidding and cable logging is impractical because of the great divergence between sizes and efficiencies of various horse skidding operations.

IV

SUGGESTED PROCEDURE FOR LOGGING FOOL CREEK WITH THE NORTHBEND SYSTEM

Suggested Procedure for Logging Pool Creek with the Northbend System

The procedure outlined in the following discussion is merely a suggestion. In the actual operation, unforseen difficulties may arise that prohibit its use. However, to complete the discussion of the Northbend System begun in the body of this paper, it seemed proper to suggest a procedure for operation.

Following are itemized lists of the more important pieces of equipment and manpower needed to operate the Northbend System:

Equipment:

1 D-6 tractor (for yarding)

1 D-6 tractor donkey (double-drums)

1 D-2 tractor (for decking) /1

Rigging:

4 Skyline blocks with swivel shackle

8" x 1 3/4" sheave, 9/16" max line, 55 lbs.

5 blocks (1 carriage block, 2 fall blocks, 2 main-line blocks)

7" x 1 3/8" sheave, 3/4" max line, 22 lbs.

/1 If a small tractor is available for decking the logs, considerable extra handling could be avoided. It may be possible, however, to deck the tree-length logs at the head spar and to buck them at this point after the operation has moved to the next set. The logs could then be moved by horses to the loading deck.

10 haulback blocks

6" x 1" sheave, ¼" max line, 13 lbs.

2 tightening blocks (double sheave)

6" x 1" sheave, ½" line

Chain or cable to fasten the haulback blocks, skyline blocks, and mainline blocks to spar trees and stumps.

Short lengths of cable to connect blocks to guylines (safety lines)

Chain and cable (chokers) for butt rigging assembly

Cable:

1400 ft.	9/16"	16 x 9	Improved	Plow Steel	skyline
1250 ft.	½"	"	"	"	mainline
5000 ft.	¼"	"	"	"	haulback line
1000 ft.	⅜"	"	"	"	guylines

150 ft. ½" hemp rope for rigging

1 gasoline powered saw for bucking

<u>Manpower</u>:

Yarding:

1 rigging slinger and whistle punk

1 cat skinner

1 choker setter

1 chaser

Rigging:

1 rigger

1 ass't. rigger (with horse)

Decking:

1 cat skinner

Bucking:

2 buckers at landing with power saw

Falling and Limbing:

4 or 5 fallers and limbers to keep ahead of yarding operation. (hand saws and axes)

Total: Approximately 14 men

Although this manpower estimate seems high, it must be remembered that the logging operation should proceed efficiently. Since the speed of logging will be much faster than when horses are used, more manpower must be concentrated for a shorter period of time. One need only consider the number of horses and men needed to maintain an 18M to 25M daily output.

Following is a rough comparison between the time for yarding and the time for falling and limbing:

Merchantable acres: 550

Vol. on watershed: 6463 Mbf

Vol. to be cut: 3232 Mbf

Yarding:

Strip width: 150 ft.

Average strip length: 800 ft.

Area of strip: 2.75 acres

Avg. vol. per tree: 125 b.f.

Avg. vol. on strip: 33 Mbf

Avg. vol. per run (3 trees): 375 b.f.

Runs per set: 90

Time to hook up: 2 min.

Time to skid 400 ft.: 3 min.

Time to unhook: 1 min.

Time to return 400 ft.: 1.5 min.

Total time per run: 7.5 or 8 min.

Time to skid 1 Mbf: 20 min.

Time to skid 33 Mbf: 11 hrs. approx.

Time to hook to new set:)

Time for unhooking from old set:) 2 hrs.

Total time to hookup, skid, and transfer on each set: 13 hrs.

Time to rig new set: 5 hrs. (done one set ahead)

Number of strips logged by cable on entire watershed: 85 approx.

Number strips logged by horses: 17

Total number of strips: 102

Falling and Limbing:

Avg. falling time: 3 min.

Avg. limbing time: 2.5 min.

Avg. topping time: 1.5 min.

Moving time: 1 min.

Total: 8 min. per tree

Approximate number trees felled and limbed per man per 7 hr. day: 50

Avg. vol. per tree: 125 b.f.

Avg. vol. cut and limbed per man per day: 6,250 b.f.

Avg. vol. yarded by cable per 7 hr. day: 19 Mbf

Men needed to keep ahead of yarding: 3

For safety add: 2

Total men: 5 at most

According to this analysis, no trouble should be encountered in falling and limbing enough trees to keep ahead of the yarding operation. It is felt that considerable leeway has been given to allow for unforseen diffi-

culties. It must be remembered that many of the times quoted were for winter work. The number of trees felled and limbed per man per day should approach 65 to 75 during the summer when longer working days may be maintained. If such an output is found to be feasible, three fallers and limbers might be able to keep up with the yarding. However, this obviously must be tried in the field before any accurate statements can be made as to the exact number of men needed.

(1) Falling and limbing:

For the operation to proceed smoothly, the cutters should be cutting at least one strip ahead of the yarding. The rigger and his assistant, after a little experience, may go ahead and mark the trees most suitable for spar trees. These will be left by the cutters. All other trees on the strip of merchantable size will be cut down, limbed, and topped. Whenever possible, trees should be cut so they will fall on the strip. Furthermore, trees should not be felled upon clumps of advance reproduction. Other techniques of felling to facilitate the work of the choker setter will undoubtedly develop as the work progresses.

(2) Rigging:

The rigging of the spar trees will require two men, a rigger and an assistant with a horse. All rigging

should be done after the fallers have completed the cutting of a strip. This would be advantageous from the standpoint of safety as well as speeding up the work of rigging.

The spar tree must first be limbed to the height believed necessary to lift the skyline to the proper operating height. This height can be estimated by the rigger with considerable accuracy after a little experience.

The skyline blocks do not need to be hung any higher than the terrain demands.

Experience in the field will show whether or not the spar trees will need to be topped. Considerable time and money can be saved if the spar trees do not whip too much with the tops on. Four guylines on the head spar and two or three on the tail spar should be sufficient to keep the spars steady without topping. However, if safety demands it, time should be taken to top the spar trees.

After the spar trees have been limbed and topped, the rigger's assistant will send up the rigging block on a light line. This is a small block that is hung high up and used to haul other blocks and lines up to the rigger. The rigger will then secure this block with chain or a short length of cable and pass the one-half inch rope through it. The skyline blocks, the mainline block, and the haulback block are then hauled up and secured to the spar by the rigger. The guylines should then be hauled

up and secured at a point just above the skyline block. For safety, each block should then be attached to a guyline with a short length of cable.

Half of the 5000 ft. of quarter-inch haulback line will be used by the rigging crew. The rigger will thread this line through the skyline block on the head spar before coming down. This line will be hauled out to the tail spar by the horse and threaded through the skyline block there.

A corner block will then be secured at a distance to the rear of the tail spar and the line passed through this block. Other haulback blocks will also be hung on stumps along the edge of the strip, and the line threaded through these and brought back to the head spar. The preliminary work of the rigger is then completed.

(3) Transferring:

When the yarding of one strip has been completed, the mainline will be unhooked from the carriage block and rolled up on its drum. The haulback line will be disconnected from the butt rigging and from the drum and hauled to the next set to be rigged by horse power or by the small D-2 tractor. All blocks except the skyline blocks will then be brought in and loaded onto the tractor. The skyline will then be loosed at the tail spar and the tightening-rigging removed and loaded. The head spar end of the sky-

line will then be hooked to the drawbar of the tractor. With this arrangement, the use of a stub line is unnecessary.

The skyline is then drawn through the skyline blocks as the tractor moves to the next set. The carriage block may be carried to the next set by one man.

When the tractor arrives at the head spar of the next set, the skyline is unhooked from the drawbar. The tractor is then used to tighten the guylines on the head spar. After this is completed, the end of the skyline is hooked to the end of the new haulback line leading through the head spar skyline block. The other end of the haulback line will then be fastened to the empty haulback drum on the tractor. The skyline will then be hauled through the head spar skyline block and the carriage block attached.

Before the skyline is hauled much beyond the head spar, the haulback line should be unhooked and threaded, by use of the half-inch hemp rope, back through the mainline block. The mainline should then be hauled through its block in the manner described above and run through the fall block and hooked to the carriage block. The haulback line may then be hooked to the end of the skyline as well as to the fall block or to the butt rigging.

Then, both the skyline, and the mainline plus the carriage block, fall block (or blocks), and butt rigging

are hauled out to the tail spar.

The haulback line is disconnected from the fall block before the skyline is pulled through the tail spar skyline block. Thus, after the skyline is pulled through the skyline block and secured at the rear of the tail spar, only a short distance separates the end of the haulback line from the butt rigging.

Before hooking the haulback line to the butt rigging, however, it should be used to pull the tail tree guylines tight. After this is done, it may be hooked to the butt rigging or to the fall block and brought back to the head spar by reeling in on the mainline.

At the head spar, the haulback line is then unhooked from the butt rigging and hooked to the line through the tightening blocks. By reeling in the haulback line, the skyline may be tightened and the tightening line secured. The haulback line may then be again hooked to the butt rigging, and yarding is ready to begin.

If a small D-2 tractor is available, it may be used to tighten the skyline instead of using the arrangement just described. However, it must be kept in mind that the skyline must not be tightened too much. A certain amount of deflection is needed, because with a taut line too much of the skyline's strength is used up in supporting its own weight and maintaining the tension.

(4) Yarding:

A minimum of four men is needed for the actual yarding operation:

1 rigging slinger and whistle punk

1 cat skinner

1 choker setter

1 chaser

The "rigging slinger and whistle punk" will act both as the boss of the yarding operation and as the signalman between the cat skinner and the choker setter. As he acts in both capacities, it would probably be desirable that field telephones be used for communication between the rigging slinger and the portion of the crew near the head spar. However, a warning horn or whistle operated by the rigging slinger is needed whether telephones are used or not. Telephones could be eliminated by a system of horn signals between the rigging slinger and the cat skinner.

The warning horn or "whistle" could easily be made from a set of automobile horns and operated by a storage battery. A rubber-covered wire with button on the end could be drawn out by the rigging slinger as the yarding proceeds out the strip. As soon as the chokers are set and everyone is clear, the horn is sounded by the rigging slinger.

The cat skinner then hauls in on the mainline and

brakes the haulback line until the logs are directly under the skyline. The haulback brake is then released, and the mainline hauls in the logs.

When the logs arrive at the head spar, the chaser unhooks the chokers and steps clear. The cat skinner then disengages the mainline drum and engages the haulback drum. The chokers are pulled free as the haulback line pulls the butt rigging back out.

As the butt rigging arrives near the choker setter, a signal is given, and both the mainline and the haulback line are disengaged. The weight of the fall block and butt rigging should allow it to drop within reach. The chokers on the butt rigging are then removed by the choker setter. While the run in and out was being completed, the choker setter should have set three more chokers. The ends of these are hooked to the butt rigging in place of the empty chokers, and the logs are ready to be skidded to the head spar.

As the yarding progresses outward from the head spar, the corner block can be moved to facilitate the lateral movement of the fall block. This will assist the choker setter in moving the butt rigging near enough to the chokered logs to hook up the chokers to the rigging.

In the actual operation, it may be found that two choker setters are more efficient than one - especially in

cases where the felled trees lie near the outside edges of the strip. Also, the chokers could be set more easily by two men - especially if the logs are lying flat on the ground. Long chokers will also make hooking-up much easier.

(5) Bucking and Decking:

As the yarding operation progresses, (or after the operation is completed on a set) the D-2 tractor could hook onto the tree-length logs piled at the head spar and drag them a very short distance to the skidway. As the tree is pulled onto the skidway, two buckers with a power saw would buck the tree into the desired lengths and roll the bucked sections down the skidway a short distance to the loading deck. The time required for this operation would depend upon the distance from the head spar to the skidway. This distance should be kept under 50 feet, if possible.

After the logs are decked, they may be allowed to remain so for as long as the operator desires. Trucks may be used to haul them to the mill - or, if needed to replenish the winter log supply, they could be loaded onto large sleds and pulled down to the mill by tractor.

This ends the discussion of the logging procedure by use of the Northbend System. Although horse logging is indicated for several strips, it was not considered ne-

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A COMPARISON BETWEEN HORSE SKIDDING AND THE NORTHBEND SYSTEM

A COMPARISON BETWEEN HORSE SKIDDING AND THE NORTHBEND SYSTEM

As has been stated previously, this comparison is necessarily not entirely accurate. To be precise, and in order to be able to draw a definite conclusion concerning which of the two methods would be better to use, it would have been necessary to make time studies of operations using the two logging systems under similar conditions.

As far as the horse logging is concerned, it was necessary to use average figures for the region. A similar operation would have been very difficult to find, because of the peculiar logging conditions required on Fool Creek. For this reason, estimated costs were used, and where these costs applied to both systems, no changes were made.

Since no cost figures are available for the Northbend System of logging, it was also necessary to make estimates. It was possible to determine the fixed investment in the tractors, cable, blocks, etc., but the estimated total volume skidded per day will be the limiting factor in the accuracy of the cost estimate. However, in all cases, it is believed that every item involved in both operations has been given careful and equal consideration.

Since the relative merits of the operations depend upon skidding, the time to fall, limb, top, and buck the

trees will not be considered in the time estimates. Also, the cost comparison will include only costs accruing up until the time the logs are decked for loading.

I A Time Comparison

Since the time required to skid a thousand feet board measure is the most vulnerable factor in the cost comparison, it was given particular consideration. Following is the time comparison for the two systems (the estimate for the Northbend System is repeated here for convenience):

A. Horse Skidding:

Time Required/[1]

Number skidders: 3
Horses per skidder: 2

Avg. bd. ft. per haul: 100 per skidder
Avg. skidding time (200 ft.)
(round trip): 12 minutes per skidder

Bd. ft. skidded per hour: 500 per skidder
Time to skid 1 Mbf: 2 hours per skidder

Total No. bd.ft. skidder per hour: 1.5*
Mbf skidded per 7-hour day: 10.5

/1 These time figures were obtained from J.J. Gruenfeld, who was making a time study on the Michigan River Timber Sale.

* Actual operating time. These estimates do not include unforseen accidents, equipment failure, etc.

Time to skid average vol. on strip (33 Mbf): 22 hrs.*

Time to skid timber on entire watershed: 2155 hrs.*

B. The Northbend System

Time required:/1

Time to hook up: 2min.
Time to skid 400 ft.: 3 min.
Time to unhook: 1 min.
Time to return 400 ft.: 1.5 min.
Total time per run: 7.5 min.

Average volume per run: 375 b.f.

Time to skid 1 Mbf: 20 min.
Total bd. ft. skidded per hour: 3,000
Mbf skidded per 7-hour day: 21 Mbf

Time to skid average volume on strip (33 Mbf):	11 hrs.
Time to unhook from old set:	1 hr.
Time to hook to new set:	1 hr.
Total time per strip:	13 hrs.*

Time to skid timber on entire watershed:

Method I:

16.65% of 3,232 M horse logged = 538 M
83.35% of 3,232 M cable logged = 2694 M

Horse skidding:	359 hrs.
Cable skidding:	898 hrs.
	1257 hrs.

/1 These time estimates were compiled with the assistance of W. H. Schaeffer, Colorado A & M.

*Actual operating time. These estimates do not include unforseen accidents, equipment failure, etc.

Method II:

All watershed cable logged: 1077 hrs.*

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* Actual operating time. These estimates do not include unforseen accidents, equipment failure, etc.

II A Cost Comparison

Using the above figures for volume logged per day, the following cost comparison was made:

A. Horse skidding:

Spur Roads:
Approx. 8 miles
Truck road, 15 per cent max. grade.
Includes clearing, chunking out, rough grading, and hire of bulldozer and operator.

	Cost per M
$1,800 per mile[1]	$4.45
Skidding:	5.00
Falling, limbing, topping, bucking:	5.30
Overhead: Woods boss at $20.00 per day--prorated over 10.5 Mbf output	1.90
Ditching and Brushing-in:	.50
Compensation, Insurance, Social Security, etc	1.00
Equipment: It is assumed that each faller and skidder owns and maintains his own equipment.	
Estimated Stumpage price:	4.00
Total cost per M:	$22.15

[1] As will be noted, this cost is higher per mile than with the cable system. This is because the yarding tractor may push out the roads if the Northbend system is used.

B. The Northbend System:

Spur Roads:
2.00 miles
Truck road, 15 per cent max. grade.
Includes clearing, chunking out, and rough grading. (D6 yarder used for road building.)

	Total	Cost Per M
$1600 per mile	$3200.00	
Prorated over 3232 Mbf		$.99

Equipment:

1 D6 tractor with D6N Donkey plus dozer blade: $8000
(30 per cent depreciation).....$2400.00

1 D2 tractor (OPTIONAL): $3495
(30 per cent depreciation)..... 1048.50

4 8" x 1 3/4" swivelled blocks at $30 each..... 120.00
5 7" x 1 3/8" blocks at $30 each..... 150.00
10 6" x 1" haulback blocks at $17 ea.. 170.00
2 tightening blocks at $15 each..... 30.00
Butt rigging and chokers..... 50.00

1400 ft. 5/16 skyline at $16.95/100 ft. 237.30
1250 ft. 1/2" mainline at $13.95/100 ft.174.38
5000 ft. 1/4" haulback at $9.00/100 ft. 450.00
1000 ft. 1/2" guylines at $13.95/100 ft.139.50

150 ft. 1/2" hemp rope at $4.00/100 ft. 6.00
1 gasoline-powered 48" saw: $460
(50 per cent depreciation).....230.00

Total.....$5205.68

Cost per M (2694 Mbf).....$1.93
Cost per M (3232 Mbf).....$1.61

Operation and Maintenance Costs:	Total	Cost per M
		$1.25
Manpower:		
1 rigging slinger and whistle punk (per day).....	$18.00	
1 cat skinner (per day).....	17.00	
1 choker setter (per day).....	15.00	
1 chaser (per day).....	14.00	
1 rigger at 2.50 per hour or,.....	15.00	
1 ass't. to rigger (per day).....	11.00	
1 D2 cat skinner (per day).....	16.00	
Total cost per day....106.00		
Prorated over 21 Mbf output		5.05
Compensation, Insurance, Social Security, etc....		.60
Falling, Limbing, and Topping.....		3.00
Bucking.....		2.30
D2 tractor skidding.....		.50
Ditching and Brushing-in.....		.15
Estimated Stumpage Price.....		4.00
Total Cost per M (including D2 tractor) (2694 Mbf).		19.77
Total Cost per M (not including D2 tractor)(2694 Mbf)..		18.88
Total Cost per M (on basis of 3232 Mbf) (with D2).....		19.45
Total Cost per M (3232 Mbf) (without D2).....		$ 18.63

C. The Combined Horse-Cable System

This method of logging Fool Creek has been proposed by the writer (See Map No.2.) It was felt that by using both horses and the Northbend System a diredt comparison of the two could be obtained. If such an operation is contemplated, however, separate cost and time figures for each system should be kept. Only in this way may the relative merits of the two systems be correctly evaluated.

As has been stated, 85 strips (or 83.35%) will be cable-logged, and 17 strips (or 16.65%) will be horse-logged. These are only approximate figures, however. In the actual operation, the exact proportions of the watershed logged by each system will have to be determined.

1. Horse skidding:

As was found in the cost estimate of horse logging the entire watershed, the cost per M was found to be 18.15 dollars (without the cost of stumpage). However, since the portion of the spur roads serving the horse skidding is only four-tenths of a mile, only 20 per cent of the total cost of spur road construction will be charged to the horse operation. Also, since the D6 tractor-yarder will build the roads, the cost per mile will be considered to be 1600 dollars.

Following is a detailed estimate of the costs involved in the horse skidding:

	Cost per M
Spur roads: Total 2.00 miles, 20 percent chargeable. $1600 per mile, or $3200 total. 20 percent of $3200: $640. Prorated over 538 M.....	$1.19
Skidding.....	5.00
Falling, limbing, topping, bucking.....	5.30
Overhead.....	1.90
Ditching and Brushing-in.....	.50
	$ 12.70

16.65 percent of $12.70, or $2.11, plus $1.19 equals $3.30, or the amount contributed to the total cost by the horse-skidding operation.

2. The Northbend System

One and six-tenths miles of spur road can be charged to this portion of the operation (which will skid approximately 33.35 percent of the timber). The cost per mile will be the same:

Spur Roads	Cost Per M
Total 2 miles, 80% chargeable.	
$1600 per mile, or	
$3200 total.	
80% of $3200: $2560	
Prorated over 2694 M.....	$ .95

Equipment	
Total: $5205.68	
Prorated over 3252 M.....	1.61
Operation and Maintenance.....	1.25
Manpower.....	5.05
Falling, limbing, and topping.....	3.00
Bucking.....	2.30
D2 Tractor Skidding.....	.50
Ditching and Brushing-in.....	.15

83.35 percent of $13.86: $11.55
Spur road cost: .95

Total amount contributed
to cost by Northbend System $12.50

3. Total Cost of Combined Operation:

	Cost Per M
Cost of horse skidding.....	$ 3.30
Cost of Northbend System.....	12.50
Compensation, insurance, etc.....	1.00
Estimated stumpage price.....	4.00
Total estimated cost per M for combined system.....	$20.80

4. Discussion:

It is felt at this time that all the cost estimates quoted in the foregoing sections have been fair and equitable to both methods of operation. However, because of the limited experience of the writer, it is agreed that fallacies may exist. But, since nothing may actually be learned until the two operations are compared side by side in the field, no definite statements about the relative values of the two systems may be made at this time. However, the cost estimates and the time estimates do show that the Northbend System may be the best method to use in the logging of Fool Creek.

It is interesting to note that by comparing the smallest cost figure for the Northbend System with the cost figure for horse logging, a difference (or saving) of $4.52 is obtained. This figure, when multiplied by the total volume to be logged from the watershed totals $14,608, or enough to completely amortize the entire fixed investment in the cable system within 632 logging hours or in roughly six months. It must be remembered, however, that this is accomplished only by the savings - loading costs, transportation costs, milling costs, etc., plus a margin for profit must also be included in the final sale price of the finished lumber.

It is hoped by this writer that this cost comparison between the prevailing method in this region-- that of horse skidding --and a radically new method for this region-- the Northbend System -- will not only furnish "food for thought" to foresters and loggers; but will also stimulate some enterprising individual to <u>try</u> a cable system in this region. Only by an actual attempt to make such an operation pay may the worth of the system be proved. It is the sincere wish of this writer that this suggested procedure be given careful consideration and evaluation by the foresters and loggers of this region.

APPENDIX

Itemized List of Equipment for Use in the Northbend System

D6-60" tractor with D6N Donkey Arrangement: $7370.00
D2-40" tractor: 3495.00

Source of Prices:
McCoy Co. (Caterpillar agent)
P.O.Box 5544
Terminal Station
Denver 17, Colo.

		Each
4	Skyline Blocks 8" x 1 3/4" with swivel, 9/16" max line, 33 lbs., at.....	30.00
5	Blocks (carriage block, 2 fall blocks, 2 mainline blocks) 7" x 1 3/8", 3/4" max line, 22 lbs.,at....	30.00
10	Haulback blocks 6" x 1", 1/2" max line, 13 lbs.,at.....	17.00
2	Tightening Blocks (double sheave) 6 x 1", 1/2" max line, (no wt.) at.....	15.00

Source of Prices:
Washington Iron Works
Seattle 4, Washington

Wire rope:

1400 ft. 9/16" 16 x 9 Improved Plow Steel Skyline at $16.95 per 100 ft.

1250 ft. 1/2" 16 x 9 Improved Plow Steel mainline at $13.95 per 100 ft.

5000 ft. 1/4" 16 x 9 Improved Plow Steel haulback at $9.00 per 100 ft.

1000 ft. 1/2" 16 x 9 Improved Plow Steel guylines at $13.95 per 100.

150 ft. 1/2" hemp rope at $4.00 per 100 ft.

1 gasoline-powered 48" saw at $460.00

Source of prices:
Montgomery Ward and Co.
Denver, Colorado

Note: All above prices are retail, and except for the blocks, are F.O.B. Denver, Colorado. All prices are subject to change without notice.

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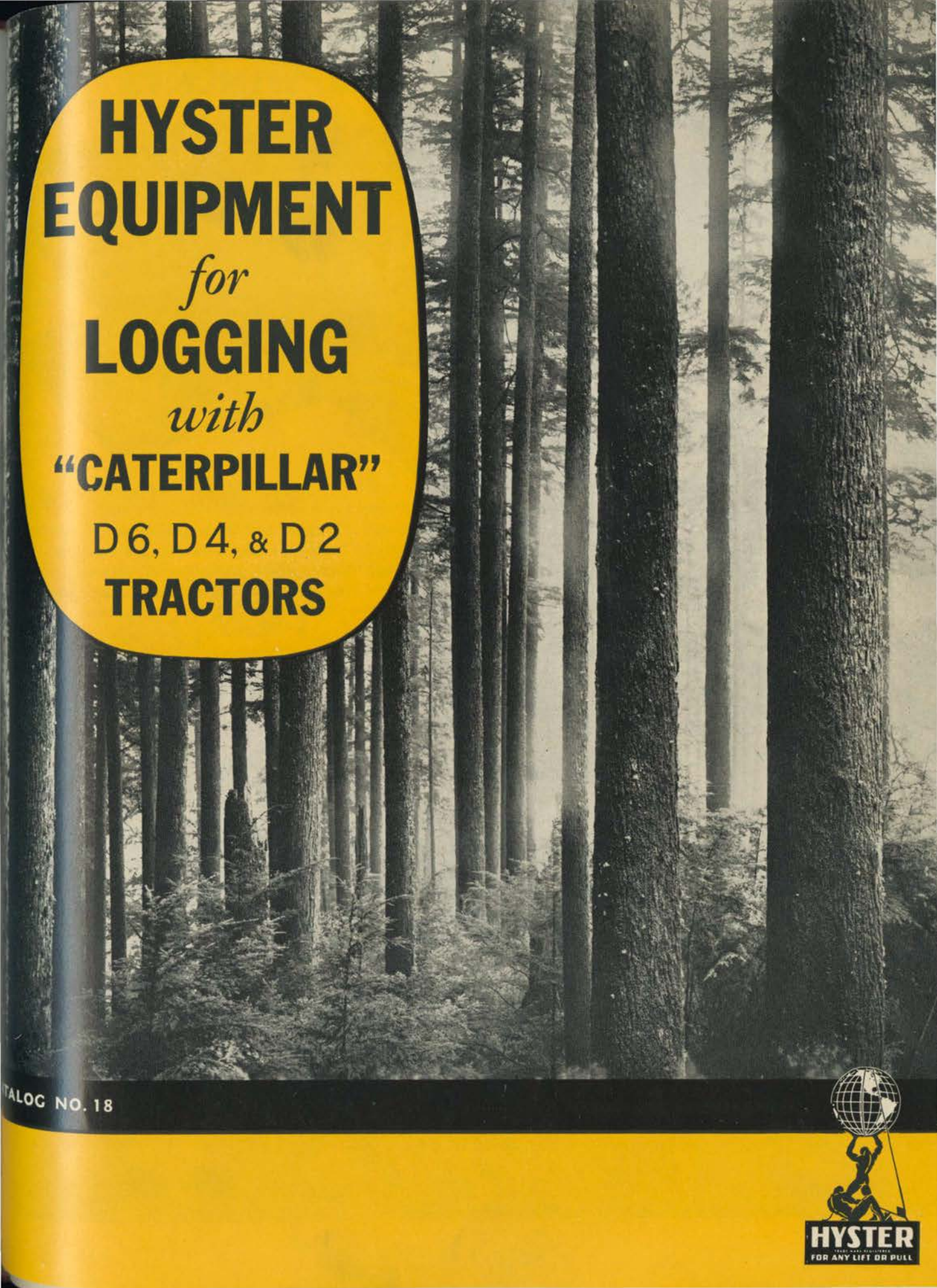


HYSTER EQUIPMENT *for* LOGGING *with* "CATERPILLAR" D 6, D 4, & D 2 TRACTORS

TALOG NO. 18

HYSTER
FOR ANY LIFT OR PULL

WORLD'S LARGEST MANUFACTURER OF TRACTOR HOISTS and WINCHES

HYSTER COMPANY
Portland, Oregon

THE COMPANY BEHIND THE PRODUCT

Hyster Company, a pioneer in tractor mounted production equipment, manufactures Towing Winches, Yarders, Dragline and Clamshell machines, Cranes, Logging Arches and Logging Sulkies. More Hyster tractor mounted winches and hoists are in service throughout the world than any other make.

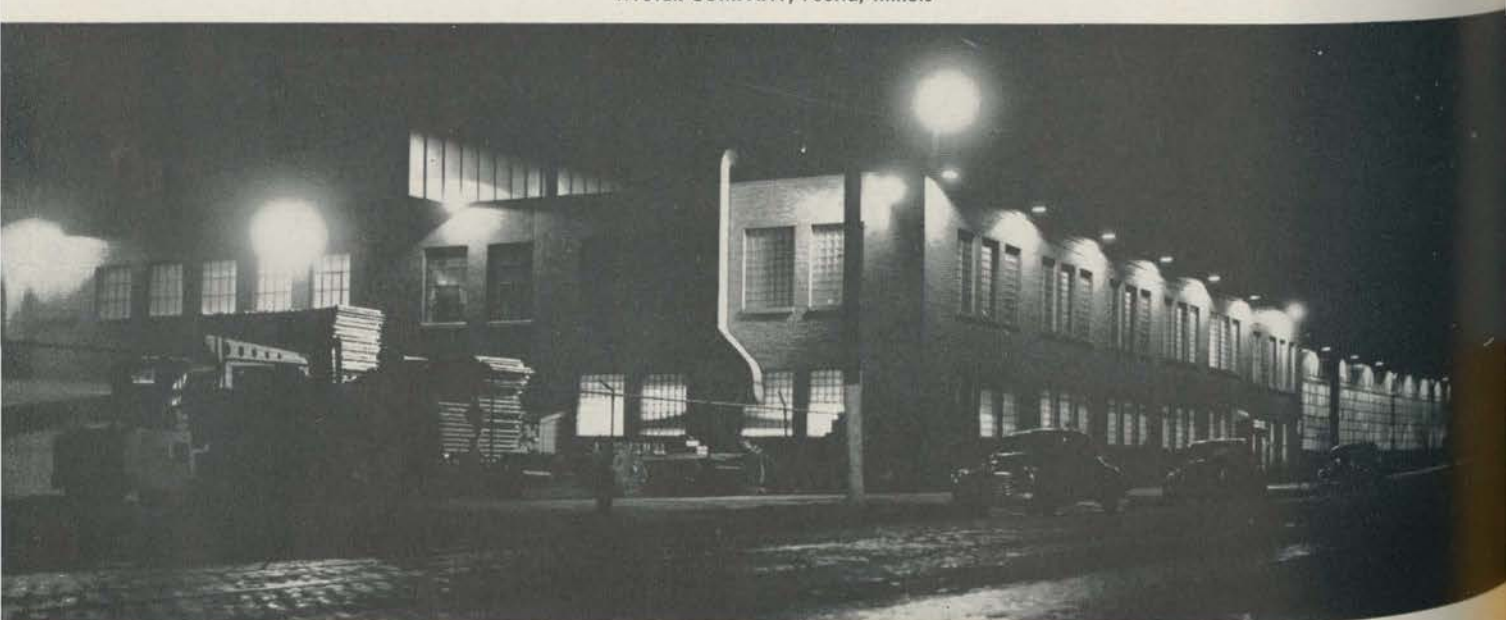
Pioneering in tractor equipment means that Hyster consistently introduces worthwhile developments in construction. These are thoroughly field tested, and countless Hyster improvements have been generally adopted as standard in the industry.

Hysters are built in two modern plants—at Portland, Oregon, and Peoria, Illinois. Hyster sales and service facilities are made available through "Caterpillar" dealers and distributors everywhere. See your "Caterpillar" dealer and get acquainted with all Hyster tractor money-makers.

To obtain full value from your tractor . . . to handle more jobs . . . faster, easier, with less labor, at lower cost . . .

USE HYSTERS!

HYSTER COMPANY, Peoria, Illinois



HYSTER WOODS-TESTED EQUIPMENT FOR PROFITABLE LOGGING

No one knows more about requirements for logging equipment than the practical, on-the-job logger.

That's the reason why Hyster engineers have worked closely with loggers in developing Hyster Towing Winches, Yarders and Logging Arches. Old-timers in the woods will recall that Hysters were made for the very first models of "Caterpillar" track-type Tractors.

Continuing co-operation of the Hyster-logger team has resulted in a line of logging equipment that does just what it is built to do—make more money for the loggers. Hyster equipment for modern logging includes:

TOWING WINCHES

Hyster Towing Winches provide auxiliary pulling power from 50 to 80 per cent greater than the tractor's drawbar pull. Hysters give any tractor the ability to handle loads that otherwise would call for a larger, more powerful tractor. With the Hyster winch line, logs may be yarded from places inaccessible for straight drawbar tow; in effect, the drawbar length therefore becomes the length of the winch line. Hyster Towing Winches are direct geared, reversible, and with control levers operated from the driver's seat. Models are made for each size of "Caterpillar" track-type Tractor.

LOGGING SULKIES AND LOGGING ARCHES

The Hyster Logging Sulky and Logging Arch provides the means to increase log production with the tractor. The logs are skidded with one end suspended under the fairlead of the sulky or arch. The logging arch is mounted on crawler wheels for maximum stability and minimum draft over wet or soft ground. The logging sulky is mounted on large pneumatic tires or steel wheels.

In operation, these units are backed into towing position and winch line connected to the pre-set log chokers. By winching in the line, the logs are yarded up under the fairlead. In towing position, only the rear ends of the logs drag the ground, thus reducing ground friction. Production is often doubled over tractor drawbar or winch ground skidding methods. The Hyster Logging Sulky performs services similar to that of the larger arch and is used mainly in lighter logging operations.

TRACTOR DONKEYS

These units provide multiple drum winches for use in high lead logging, cold decking, loading, pile driving and other uses. Ideal for hoisting and pulling work calling for one or more lines, and where the tractor unit remains stationary. Hyster Tractor Donkey controls enable the operator to sit facing the work, toward rear of the tractor. D6, D4 and D2 tractor donkeys are available in double drum models and can also be equipped with gypsy spools or niggerheads as extra items. An old tractor, unsuited for regular work, will often give years of added service when equipped with a Hyster Tractor Donkey.

HYSTAWAY

The Hystaway is a new utility and production machine for mounting on "Caterpillar" D7 or D6 Diesel Tractors. The unit combines dragline, clamshell and crane, offering advantages never before available in a tractor mounted unit. Its unique mounting retains full track oscillation, allows for maximum mobility and maneuverability of the tractor, even with muddy or rough ground conditions. For stationary work, the tracks may be locked for added stability. Because it is quickly installed or removed, the Hystaway does not tie up, or restrict, the tractor for other services.

CABLE CAPACITY OF DRUMS

To determine the amount of any size rope that can be spooled on any Hyster drums, multiply the capacity factor "F" given in specifications by rope factor "G" in table below.

Diameter Rope	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	11/16"	3/4"	7/8"	1"	1 1/8"
Rope Factor "G" ...	4.16	2.67	1.86	1.36	1.05	.828	.672	.554	.465	.342	.262	.207

PROFITABLE LOGGING with HYSTER WINCHES and "CATERPILLAR" DIESEL TRACTORS

Today modern equipment is needed to make logging pay. Obsolete equipment does not meet today's requirements, either for increased timber production, or economical operation.

Tractor logging has brought new perspectives to the logger; an incentive to operate on a more scientific, closely-controlled basis as relates to production costs. Tractor logging, with modern tractor equipment, is opening up new possibilities to loggers, large and small.

D6N Hyster winch equipped Tractor bringing in a payload of 1822 b.f. of salvaged timber (top).

Large loads of logs each trip make small timber logging profitable. Bigger loads at higher speeds are possible with Hyster Winch and Logging Arch.

Positive traction, ample line pull. Hyster D4 Winch sleds pulpwood in Quebec.

Hyster D2 Towing Winch makes ground skidding possible in this hardwood logging operation.

A Tennessee operation. "Caterpillar" D2 Tractor and Hyster Towing Winch skids a log from woods to truck ramp.

Logging pine in Washington with "Caterpillar" D6 Tractor, Hyster towing winch and Hyster arch.

Logging pulpwood with Hyster D4 Logging Sulky—20 cords per hour on 1000-foot haul.

Hyster D4 Sulky and Winch skid logs (below); 2 cords per load, 50 cords per 10-hour day.

PULPWOOD...

Hyster Logging Sulkies, used with Hyster Winches on "Caterpillar" D4 and D2 Tractors, show worthwhile cost savings over other methods. Remarkable records of increased production are made in both hard and soft woods areas. The logging sulky increases the yarding and towing output often more than 100% over straight ground-skidding methods.

Ready to drop sulky load of pulpwood at landing (below). A matter of seconds to unhook.

Logs arrive by Hyster Logging Sulky at truck loading landing.

..SAWLOGS

Some advantages of sulky logging are: cleaner logs delivered to the mill free of imbedded rocks or gravel; larger loads can be towed with less ground friction; selective logging is simplified. Because logs do not dig in, roads are not torn up. Instead, a compacting action keeps roads in better condition. Maintenance costs for tractor are reduced with sulky logging.

A D4 outfit in Adirondacks (below), goes right to stump; tows about 1000 board feet per trip.

18,000 to 20,000 bd. ft. per 8-hour day on ¾-mile haul with Hyster D4 Sulky (above).

Logging white spruce. 7 to 8 logs per load; 2500 feet haul.

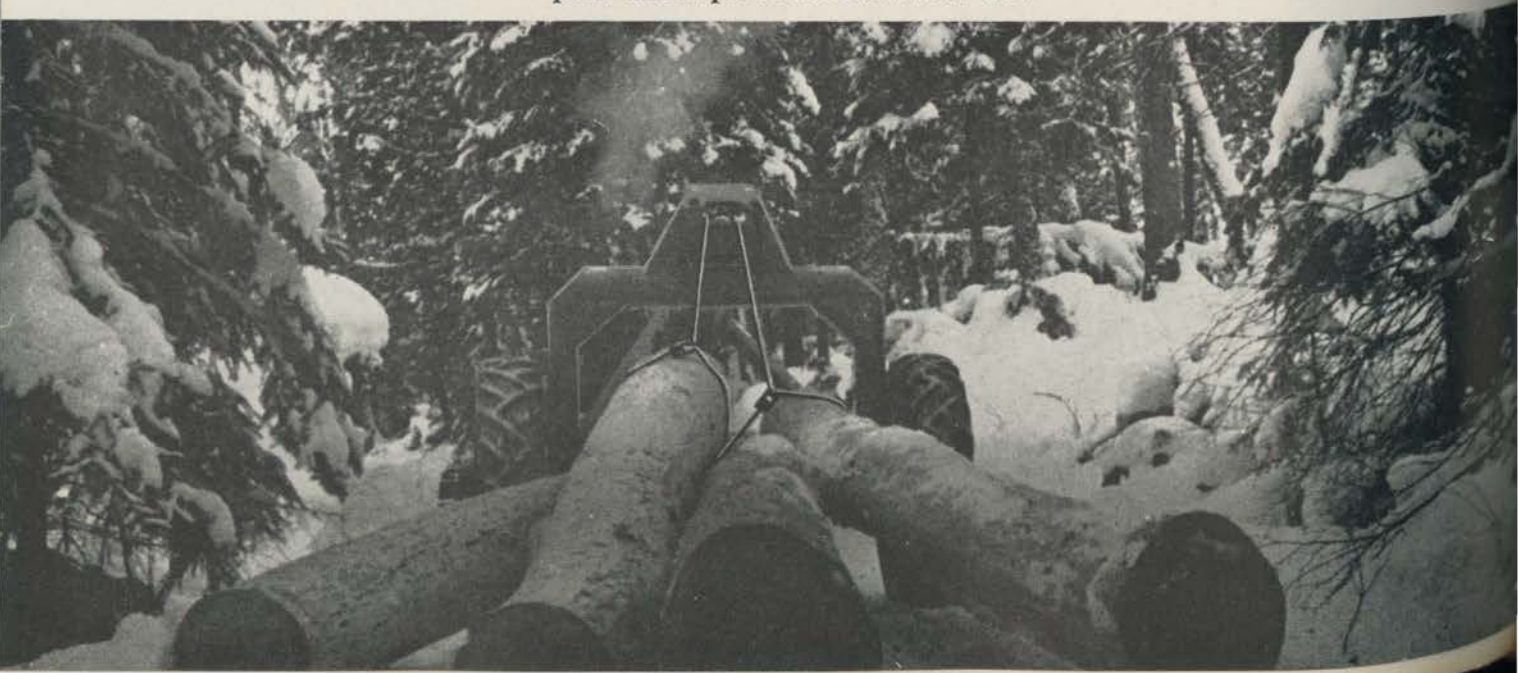
Whether it's Eastern hardwood or Western fir, the most popular logging unit is a "Caterpillar" Diesel Tractor with Hyster equipment.

BOOSTS PRODUCTION

"Caterpillar" D4, Hyster towing winch and Hyster sulky hauling tree-length pulpwood. Average load 1.78 cords.

5 and 6 logs per trip (below). Hyster D2 Logging Sulky skidding hardwood logs from stump to truck.

Working in 12 to 16 inches of snow (below). 1200 feet one-way haul. Big, husky tires and ends of logs pack and improve the road with use.



YARDING & LOADING with HYSTER TRACTOR DONKEYS

As a highlead unit for cold decking in rough country, for yarding down to arch or sulky roads from steep hillsides, Hyster's powerful Tractor Donkey can't be beat. It's moved quickly under tractor power from one setting to the next, at a minimum of unproductive time. Short yarding radius reduces damage to standing trees.

Hyster double drum yards cypress and black gum out of swamp. 32 ft. logs average 250 B.F. On 500-ft. radius, average is 10 logs per hour.

"Caterpillar" D2 Tractor with Hyster winch decking logs. Handles 20,000 bd. ft. per 8 hours.

D6N Tractor Donkey on highlead logging operation near Molalla, Oregon.

HYSTAWAY

BULLDOZER • DRAGLINE • CLAMSHELL • CRANE

All in one machine with full "Caterpillar" tractor mobility

In less than two hours your bulldozer tractor is ready to do dragline, clamshell or crane work, to dig culverts for drainage, to slope slides on truck or railroad right-of-ways, to set timbers in bridge work, to clear drainage ditches. In less than one hour a full time bulldozer tractor is ready with the Hystaway removed.

CULVERTS

The Hystaway, a ⅜ or ½ yard dragline, digs the trench, sets the pipe or logs, backfills with bucket or bulldozer. Full dragline advantage with complete tractor mobility.

BRIDGES

One machine for bulldozer, dragline, clamshell or crane work on bridge construction or maintenance jobs. A Hystaway can go anywhere a tractor can go in any weather. No need to walk in a special machine on a tractor operation.

PIONEERING

New roads to new timber are expensive and require the use of varied equipment. The Hystaway is a front line machine as well as a finish up machine as "Caterpillar" tractor mobility allows this unit to operate ahead of or behind the dozer tractor. Bridge construction and culvert work can start before the dozer tractor clears the roadway required for less mobile equipment. Limited dozer work is done with the Hystaway installed and the complete machine is ready for dozing, draglining, clamshell digging or crane work instantly.

ONE MACHINE DOES A TWO MACHINE JOB FOR LESS MONEY AND INVESTMENT.

MAINTENANCE

The Hystaway is an all purpose tool to maintain ditches, culverts, bridges, slides and turnouts. Easily and quickly installed on the dozer tractor without the use of additional equipment. It can be moved to the job over roadways, up creek beds or across country wherever tractors can go.

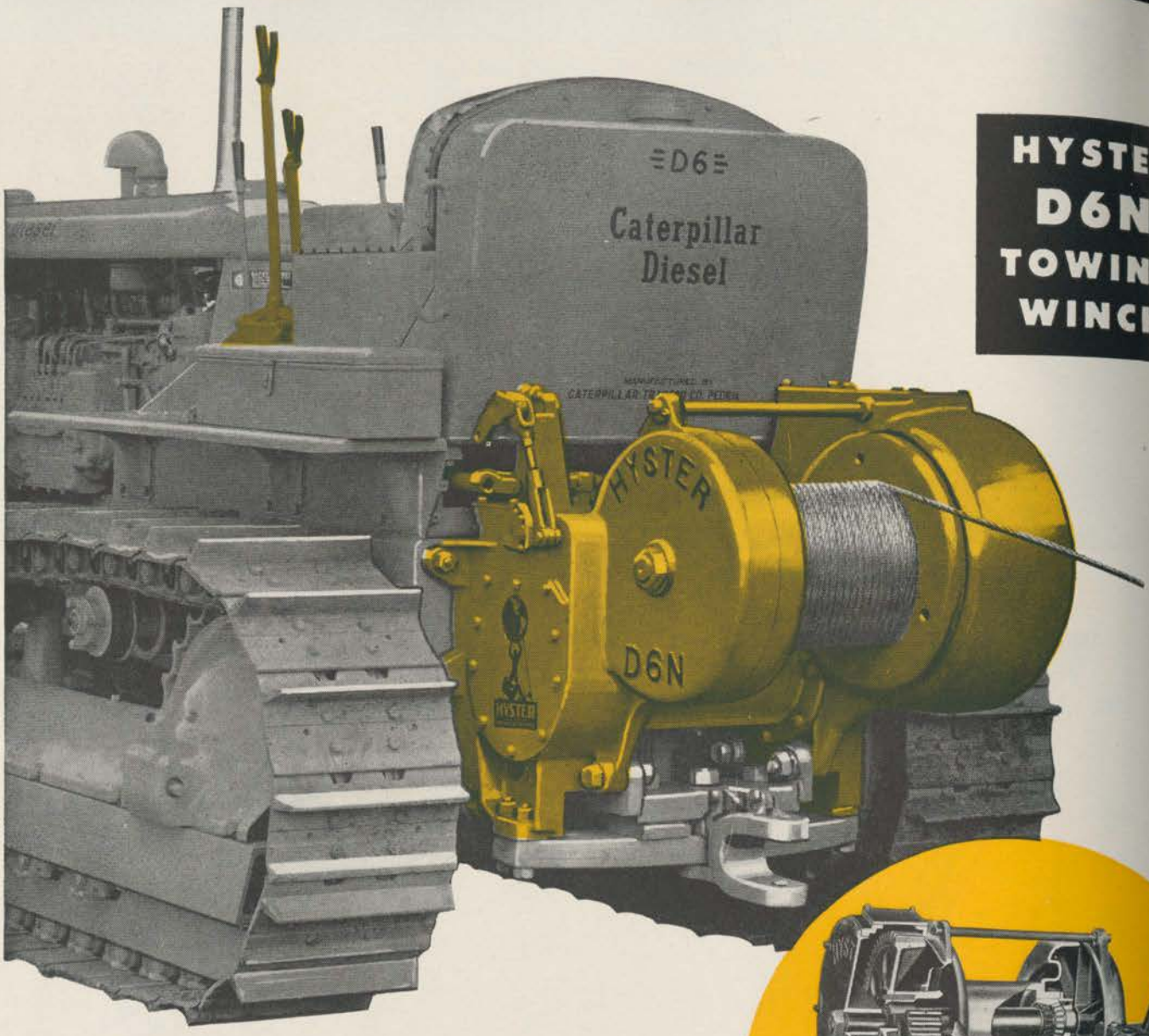
FOR NEW OR USED D8, D7 or D6

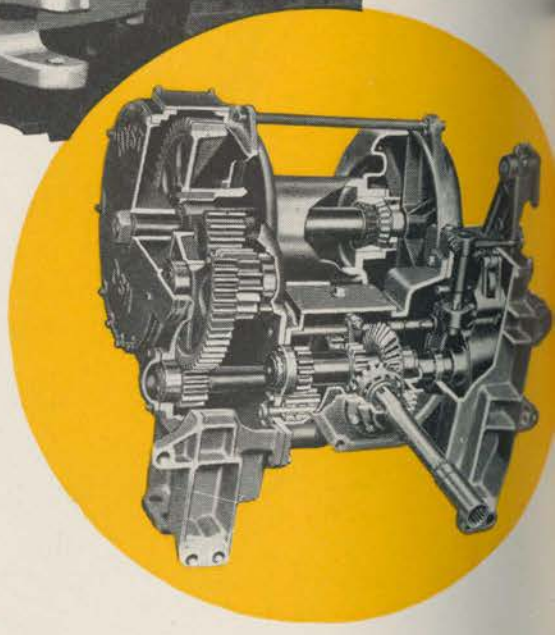
D6 Hystaway widening turnout on logging road. The 3/8 yard bucket is used to move gravel from side of bank onto the road. The dozer was then used to spread the gravel.

Setting concrete culvert pipe with the Hystaway. This access road work was shut down due to wet weather until the Hystaway, using the dragline bucket as a land anchor, pulled itself through a mud hole, dug the culvert, set the pipe and backfilled with drier earth, reopening the job. All this is made possible by using full "Caterpillar" traction and power.

Bank sloping on new access road with the Hystaway, using a ½ yard dragline bucket. This unit is also used for bridge construction, digging culverts, setting culvert pipe, backfilling with dozer or bucket, digging ditches, and miscellaneous road work. Due to the "Caterpillar" traction and power the Hystaway was able to work in extremely wet weather and keep the job open when less mobile equipment was bogged down.

HYSTER D6N TOWING WINCH





FOR "CATERPILLAR" D6 DIESEL TRACTOR

The Hyster D6N Towing Winch is a rugged, direct-geared, reversible winch for "Caterpillar" D6 Diesel Tractors (starting with serial number 8U1, 9U1, 4R1, 5R1). For logging and towing service of every description.

POWERFUL LINE PULL. Up to 27,000 lbs.—58% greater than drawbar pull.

AMPLE BRAKES. Operating through a gear reduction of 12½ to 1, the braking power is more than ample for any load.

EASY ON LINE. Large 10" diameter drum barrel and properly formed drum flanges make for longer cable life.

EASY TO OPERATE. Control levers conveniently located in front of operator's seat.

LUBRICATION. Complete oil bath lubrication for all moving parts.

SPECIFICATIONS

Hyster Model — **D6N TOWING WINCH**

Drum size:
- Barrel diameter ..... 10"
- Flange diameter ..... 20"
- Barrel length ..... 12"

Cable capacity, maximum line
400 ft. ¾" or 300 ft. ⅞"
(Allowance should be made for loose and unevenly spooled line in towing service)

Capacity factor "F" 878

Available Line Pulls:
- Bare drum ..... 27,000 lbs.
- Full drum ..... 15,000 lbs.

Line Speeds:
- Bare drum ..... 92 f.p.m.
- Full drum ..... 161 f.p.m.

(Line speeds and pulls are the same when overwinding or underwinding)

Net weight (without cable)... 1.625 lbs.
Domestic shipping wt., approx. 1,700 lbs.
Code word ..... SXNTW

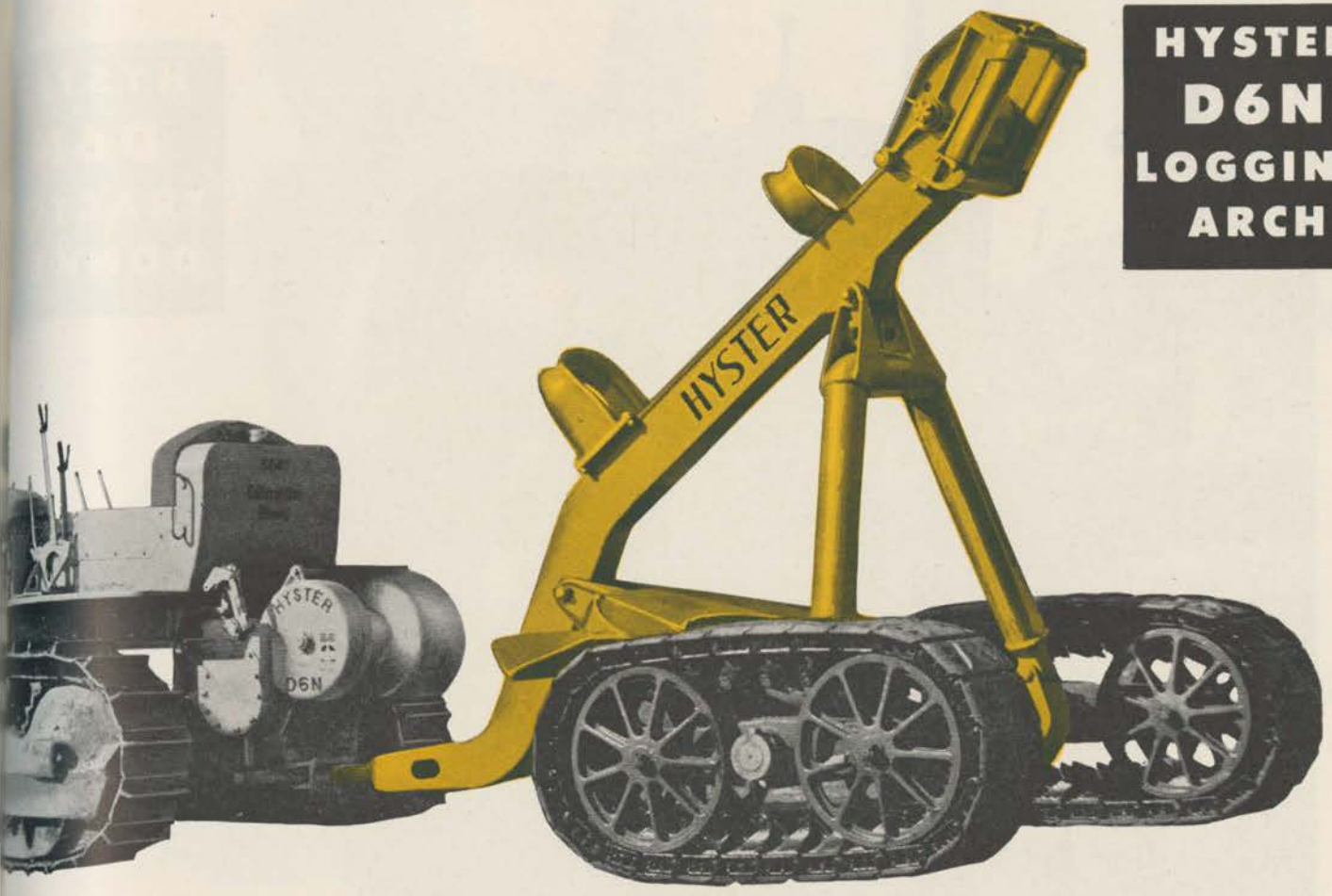
Optional high and low speed gearing available. Line speeds: 107 f.p.m. and 71 f.p.m.

Specify serial number of tractor on which equipment is to be installed.
Subject to improvements and changes in specifications without notice.

Reversible single speed direct gear design. Simple rugged gearing.

The drawbar reinforcer shown is optional equipment for logging arch service.

HYSTER D6N LOGGING ARCH



FOR LOGGING WITH "CATERPILLAR" D6 DIESEL TRACTOR

For use with "Caterpillar" D6 Diesel Tractor and Hyster D6N Towing Winch. Features include:

TRACTOR BALANCE. Scientifically designed to retain best tractor balance for maximum traction.

DURABILITY. Highest grade materials skillfully fabricated and carefully engineered.

STABILITY. A-frame design gives maximum wheel tread.

VISIBILITY. Narrow box section boom and tubular A-frame permits maximum view.

LOG CLEARANCE under fairlead is ample for maximum loads.

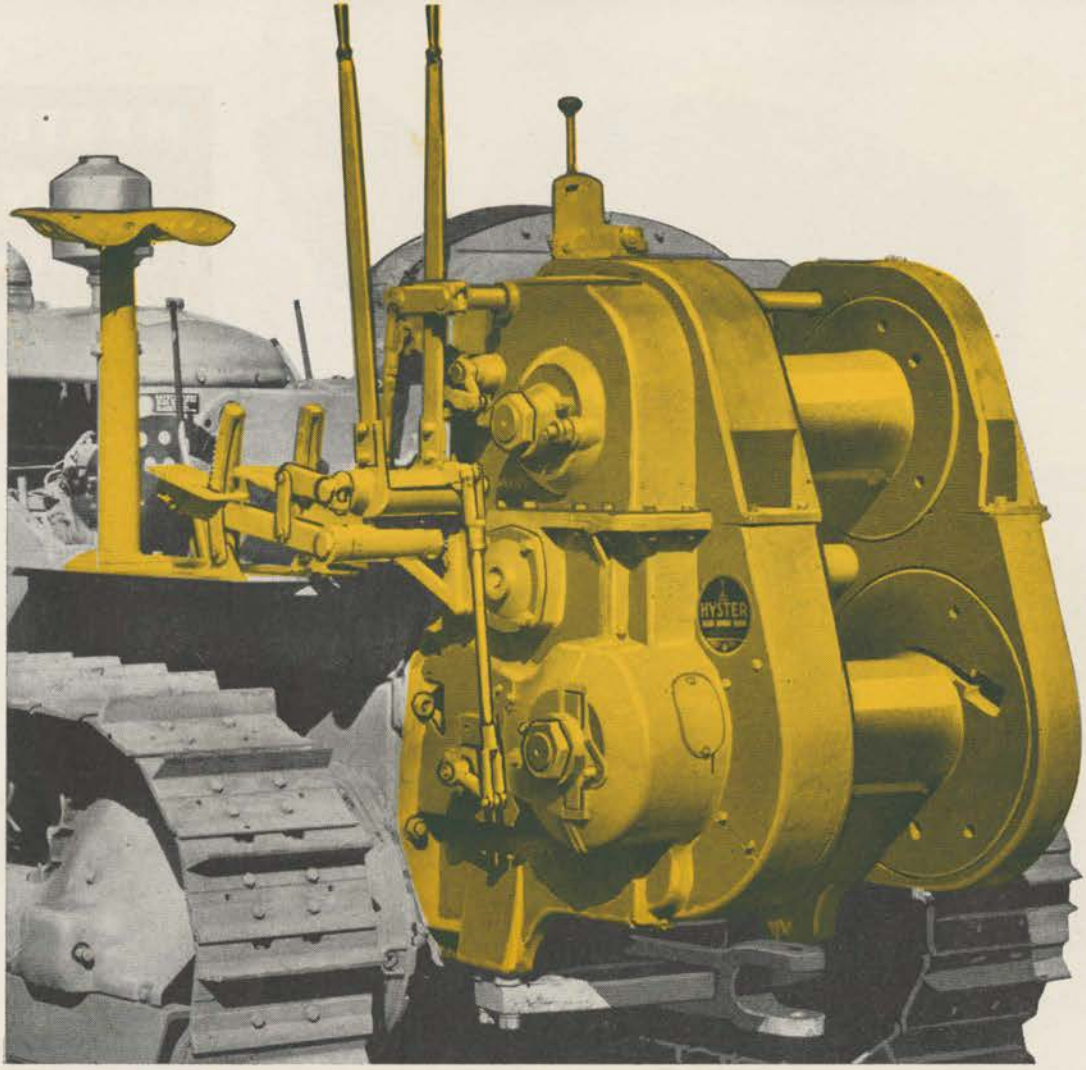
SPECIFICATIONS

Hyster Model — **D6N LOGGING ARCH**

Overall width	9′ 2″
Wheel tread, center to center of wheels	7′ 8″
Inside width between hubs	4′ 8″
Wheelbase, from axle to drawbar pin, adjustable from	8′ 9″ to 9′ 6″
Roll overhang, from axle to rear of roll, adjustable from	1′ 3″ to 2′ 0″
Roll height, to top of roll, adjustable from	8′ 11″ to 9′ 7″
Diameter of horizontal roll	10″
Diameter of vertical rolls	4½″
Diameter of wheel axles	4″
*Wheels	Model 7D6 Athey Wheels
Net weight, without wheels, approximately	3100 lbs.
Code word	SXAFA

*For information on Athey Wheels refer to Athey Products Corporation's catalog.

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.



HYSTER D6N TRACTOR DONKEY

FOR "CATERPILLAR" D6 DIESEL TRACTOR

MOBILE DOUBLE DRUMS

Hyster D6N Tractor Donkey is for use on "Caterpillar" D6 Diesel Tractors starting with serial numbers 8U1, 9U1, 4R1, 5R1.

Mounted on a "Caterpillar" track-type Tractor, the Hyster Tractor Donkey provides a MOBILE hoist unit that moves under its own power over any ground surface. Designed for yarding, loading logs and for general hoisting service. Features include:

FULL TRACTOR MOBILITY for fast moves.

TWO SPEEDS on both friction driven drums.

FREE SPOOLING DRUMS mounted on anti-friction roller bearings.

EASY OPERATION. Pin-toggle friction control on both drums.

DRUM BRAKES. Enclosed contracting type.

Gypsy spool available as additional extra item.

Single drum model available.

SPECIFICATIONS

Hyster Model — D6N TRACTOR DONKEY

	Main Drum	Upper Drum
Drum size:		
Barrel diameter	10″	10″
Flange diameter	23½″	19″
Barrel length	18″	18″
Cable capacity:	700 ft. ⅞″	1,240 ft. ½″ or
Maximum line, evenly spooled	or 860 ft. ¾″	1,600 ft. $\frac{7}{16}$″
Capacity factor "F"	2035	1175
Available Line Pulls:		
Low gear, bare drum	25,000 lbs.	9,200 lbs.
Low gear, full drum	12,500 lbs.	5,000 lbs.
High gear, bare drum	14,000 lbs.	4,600 lbs.
High gear, full drum	7,200 lbs.	2,500 lbs.
Line Speeds:		
Low gear, bare drum	95 f.p.m.	270 f.p.m.
Low gear, full drum	200 f.p.m.	495 f.p.m.
High gear, bare drum	185 f.p.m.	520 f.p.m.
High gear, full drum	385 f.p.m.	970 f.p.m.

Net weight, approximately ..... 3,365 lbs.

Domestic shipping weight, approximately ..... 3,515 lbs.

Code word ..... SXDDD

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

HYSTER D4 LOGGING SULKY

FOR "CATERPILLAR" D4 AND R4 TRACTORS

Designed for use with "Caterpillar" D4 Tractor equipped with Hyster D4 Towing Winch.

Ideal for skidding pulpwood logs, poles and small timber. Increases tractor's production capacity by carrying forward ends of logs off the ground—thus reducing ground friction. Assures cleaner logs free of imbedded rocks. Reduces upkeep on logging roads.

SULKY COUPLER

Furnished with **PNEUMATIC TIRES,** as illustrated, size 13.00x24, 16 ply, or with broad convexed steel wheels.

Pneumatic tires recommended for most conditions but steel wheels are satisfactory for roading service on dry firm ground.

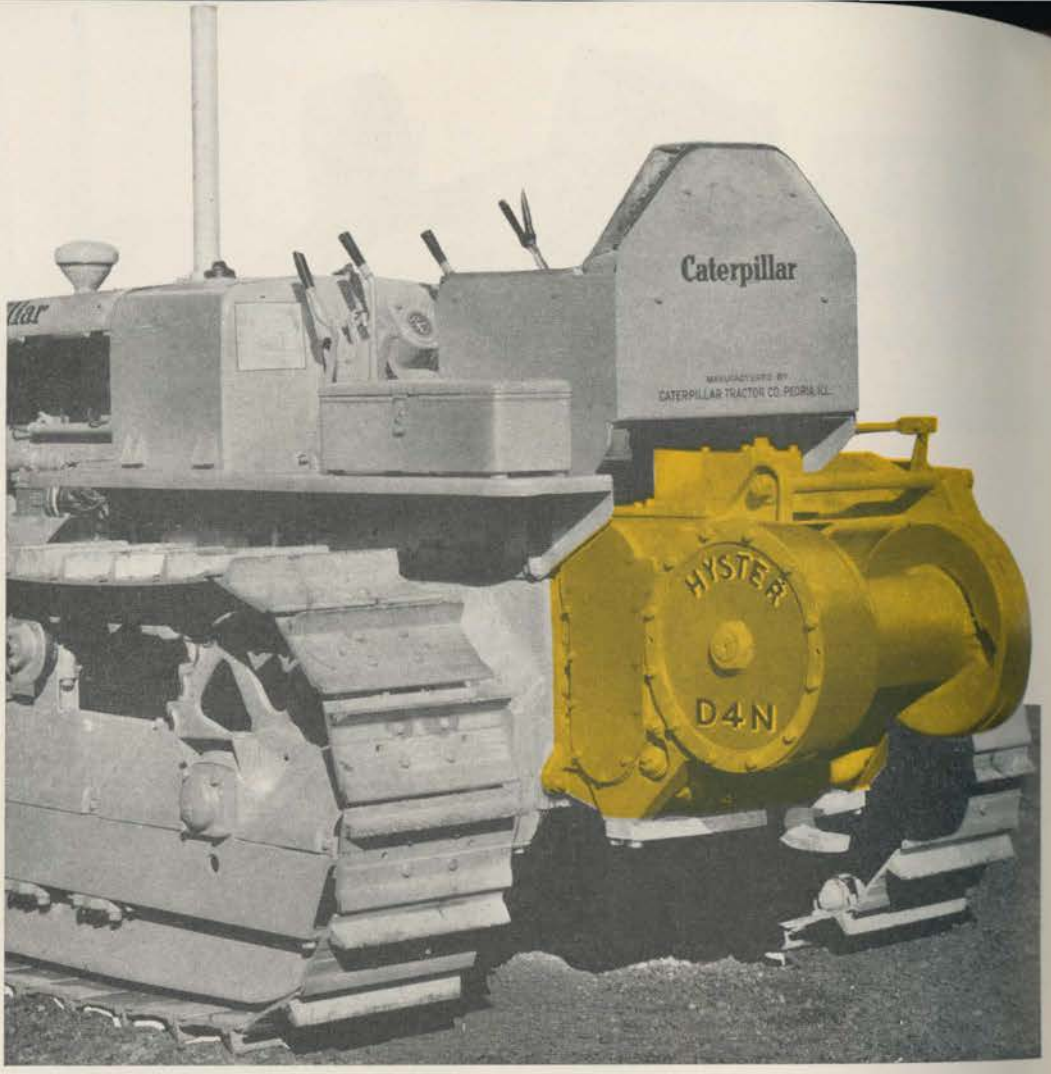
SPECIFICATIONS

Hyster Model — **D4 LOGGING SULKY**

Wheelbase, drawbar to axle	9′ 0″
Tread, center to center of tires	7′ 7″
Overall width	8′ 9″
Inside width	5′ 1″
Roll height, to top of roll	7′ 0″
Inside height to underside of arch	5′ 6″
Overhang of roll, from axle	1′ 4½″
Horizontal roll diameter	9″
Vertical roll diameter	4½″
Front sheave throat diameter	5″
Wheel-bearings	Timken
WITH PNEUMATIC TIRES (size 13.00x24—16 ply)	
Net weight, approximately	2,600 lbs.
Domestic shipping weight, approximately	2,600 lbs.
Code word	DFLSU
WITH STEEL WHEELS (tire width 12″, diameter 4′ 4″)	
Net weight, approximately	2,675 lbs.
Domestic shipping weight, approximately	2,675 lbs.
Code word	DFSSW

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

HYSTER D4N TOWING WINCH



FOR "CATERPILLAR" D4 DIESEL TRACTOR

The Hyster D4N Towing Winch is a rugged, direct-geared, reversible winch for "Caterpillar" D4 or R4 Tractors. For logging and towing service of every description.

Power take-off for hydraulic pump available at additional cost. (Built into winch at factory.)

FEATURES

POWERFUL LINE PULL. Up to 17,020 lbs.

AMPLE BRAKES. Braking power is more than ample for any load and allows full free spooling of drum.

EASY ON LINE. Large diameter drum barrel and properly formed drum flanges make for longer cable life.

EASY TO OPERATE. Control levers conveniently located. Virtually fingertip control on brake and clutch levers.

SINGLE SPEED, DIRECT GEAR DESIGN with reversible, rugged gearing. Efficient—all shafts turn in anti-friction bearings. Complete oil bath lubrication.

SPECIFICATIONS

Hyster Model — **D4N Towing Winch**

Drum size:
- Barrel diameter ..... 8"
- Flange diameter ..... 16½"
- Barrel length ..... 14"

Cable capacity, maximum line ..... 484 ft. ⅝" or 335 ft. ¾"

(Allowance should be made for loose and unevenly spooled line in towing service.)

Capacity factor "F" 720

Available Line Pulls:
- Bare drum ..... 17,020 lbs.
- Full drum ..... 9,164 lbs.

Line Speeds:
- Bare drum ..... 91 f.p.m.
- Full drum ..... 169 f.p.m.

(Line speeds and pulls are the same when overwinding or underwinding.)

Net weight (without cable) ..... 1300 lbs.

Domestic shipping weight, approximately ..... 1375 lbs.

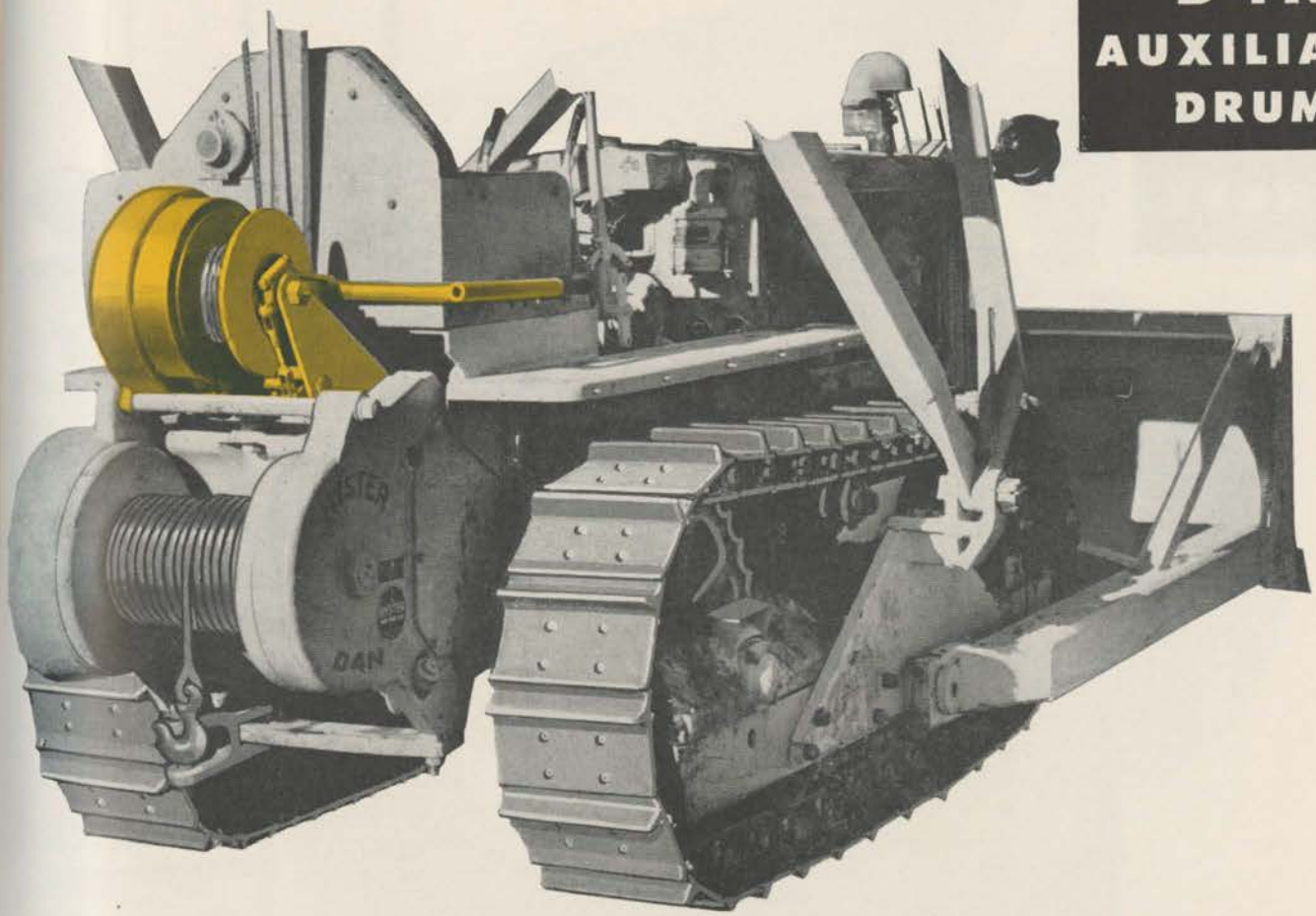
Code word ..... FNDTW

NOTE: On D4 or R4 tractors earlier than 7J9215 or 6G2076 tie plates are needed for attaching the winch to the tractor. Be sure to specify serial number of the tractor when ordering.

Subject to improvements and changes in specifications without notice.

Specify serial number of tractor on which equipment is to be installed.

HYSTER D4N AUXILIARY DRUM



FOR HYSTER D4N TOWING WINCH

Beginning with Serial Number BWN-32478 and up.
And D4 Towing Winch beginning with Serial Number BW-7806.

The HYSTER D4N Auxiliary Drum makes possible the combination installation of a cable operated bulldozer and a Hyster towing winch on a "Caterpillar" D4 tractor. In addition to use as a cable control unit it is also adapted to the following uses:

HAULBACK DRUM FOR TAKING OUT MAINLINE

OPERATING PILE DRIVER HAMMER

YARDING POLES OR LIGHT LOGS

POWER TOPPING WINCH FOR CRANE ATTACHMENT

The HYSTER D4N Auxiliary Drum — single speed, free spooling, friction drive — has Safety ratchet and powerful brake. Control lever is located alongside tractor seat for convenient operation.

The single control lever arrangement is standard equipment and is preferable for operating bulldozer blade and certain other applications such as boom topping. But separate control of brake and clutch is desirable for such work as pile driving and yarding logs and for that use a special control set with two control levers is available.

SPECIFICATIONS

The D4N Auxiliary Drum is of rugged construction and contains the best anti-friction bearings and alloy steel gearing. The unit is entirely lubricated by the winch transmission oil. No grease fittings are needed for the gear assembly.

DRUM SIZE:	Barrel diameter	5½"
	Barrel length	5½"
	Flange diameter	12"
DRUM CAPACITY:	290 feet of ⅜ inch line.	
	165 feet of ½ inch line.	
LINE PULL:	Bare drum	3540 lbs.
	Full drum	1820 lbs.
LINE SPEEDS:	Bare drum	283 ft. per minute
	Full drum	550 ft. per minute
NET WEIGHT:	Approximately 400 lbs.	

Code word..... FNHDAD

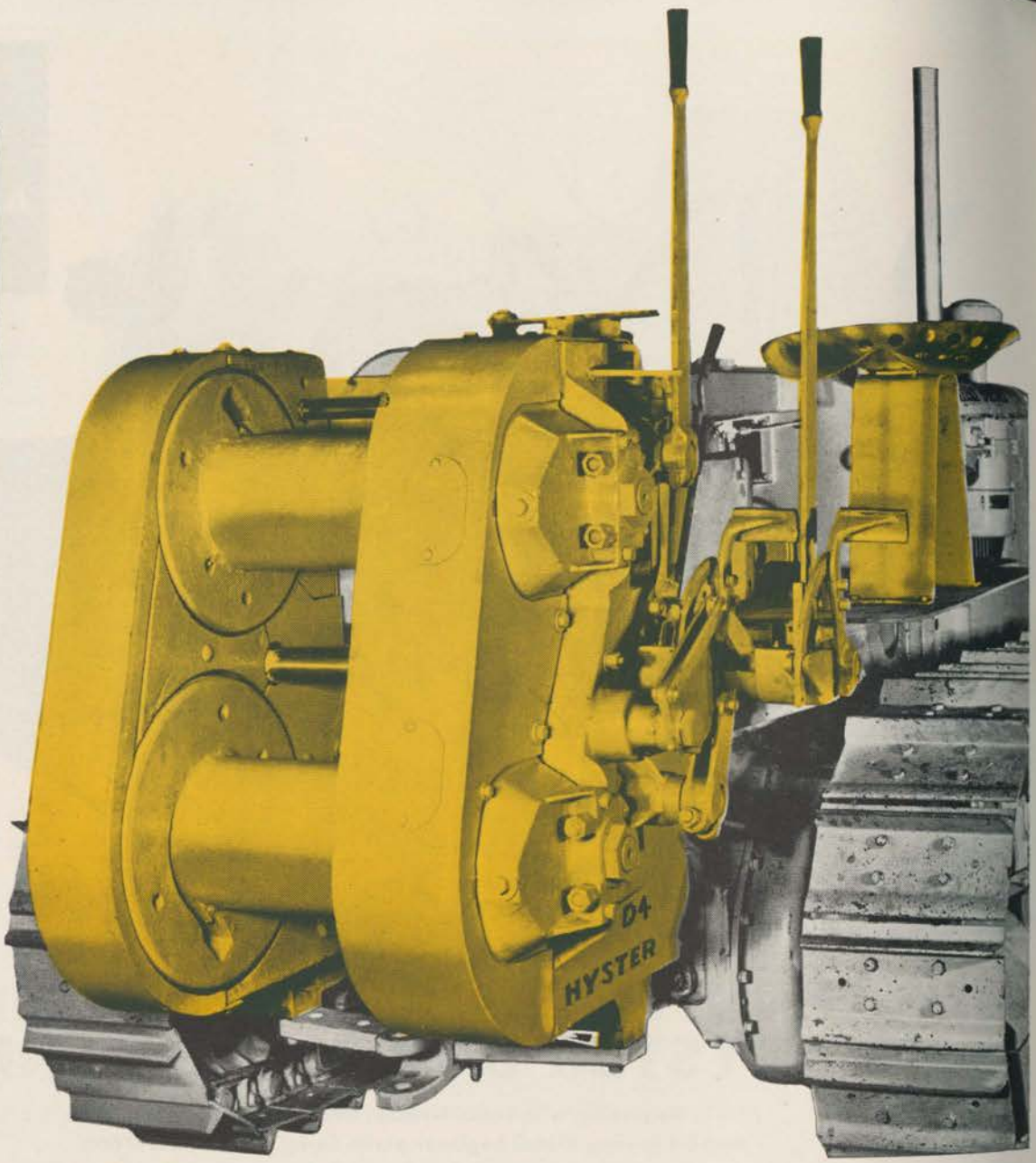
(Subject to improvements and changes in specifications without notice.)

Due to the direction of the rotation of the tractor power take-off shaft, the D4N Auxiliary Drum cannot be used with D4 Towing Winches and D4N Towing Winches installed on non-current D6 tractors.

Specify Serial No. of towing winch on which equipment is to be installed.

PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

HYSTER D4 TRACTOR DONKEY



FOR "CATERPILLAR" D4 AND R4 TRACTORS

The Hyster D4 Tractor Donkey is a double drum, two speed, friction drive hoist for use on the "Caterpillar" D4 or R4 Tractor.

Converts tractor into mobile hoisting unit with full tractor mobility.

Quick moves between jobs cuts unproductive time to a minimum.

Uses include:

DRAGLINE SCRAPER OPERATION
HIGHLEAD LOGGING
LOADING TRUCKS
PILE DRIVING
HOISTING BUILDING MATERIALS, ETC.

NOTE: On D4 or R4 tractors earlier than 7J9215 or 6G2076 tie plates are needed for attaching the winch to the tractor. Be sure to specify serial number of the tractor when ordering. Gypsy spool available as additional extra item.

SPECIFICATIONS

Hyster Model — D4 TRACTOR DONKEY

	Main Drum	Upper Drum
Drum size:		
Barrel diameter	9"	8"
Flange diameter	19"	16"
Barrel length	14"	14"
Cable capacity, maximum line	660 ft. 5/8"	1,280 ft. 3/8"
Capacity factor "F"	980	672
Available Line Pulls:	Main Drum	Upper Drum
Low gear, bare drum	13,300 lbs.	7,800 lbs.
full drum	6,900 lbs.	4,200 lbs.
High gear, bare drum	7,600 lbs.	4,500 lbs.
full drum	4,000 lbs.	2,400 lbs.
Line Speeds:		
Low gear, bare drum	103 f.p.m.	175 f.p.m.
full drum	197 f.p.m.	328 f.p.m.
High gear, bare drum	180 f.p.m.	305 f.p.m.
full drum	340 f.p.m.	570 f.p.m.
Net weight, including controls, approx.		1,730 lbs.
Domestic shipping weight, approx.		1,830 lbs.
Code word		FOTRD

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

HYSTER D2 LOGGING SULKY

FOR "CATERPILLAR" D2 OR R2 TRACTOR

For use with "Caterpillar" D2 tractor equipped with Hyster D2 Towing Winch.

Ideal for skidding pulpwood logs, poles and small timber. Increases tractor's production capacity by carrying forward ends of logs off the ground, thus reducing ground friction.

Delivers cleaner logs to mill free of imbedded rocks. Reduces upkeep on logging roads.

Pneumatic tires (illustrated) are standard equipment or can be supplied with broad convex steel wheels. Pneumatics are recommended for most conditions but steel wheels are satisfactory for roading service on dry firm ground.

SULKY COUPLER

SPECIFICATIONS

Hyster Model — D2 LOGGING SULKY

Wheelbase, drawbar to axle	9′ 0″
Tread, center to center of tires	6′ 9″
Overall width	7′ 8″
Inside width	4′ 9″
Height to top of rear sheave	6′ 0″
Inside height to under side of arch	4′ 9″
Overhang of rear sheave from axle	1′ 3½″
Wheel-bearings	Timken
Rear sheave throat diameter	7″
Front sheave throat diameter	5″
WITH PNEUMATIC TIRES (size 11x24—14-ply)	
Net weight, approximately	1,700 lbs.
Domestic shipping weight, approximately	1,700 lbs.
Code word	DTLOS
WITH STEEL WHEELS (tire width 10″, diameter 4′ 4″)	
Net weight, approximately	1,800 lbs.
Domestic shipping weight, approximately	1,800 lbs.
Code word	DTSWS

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

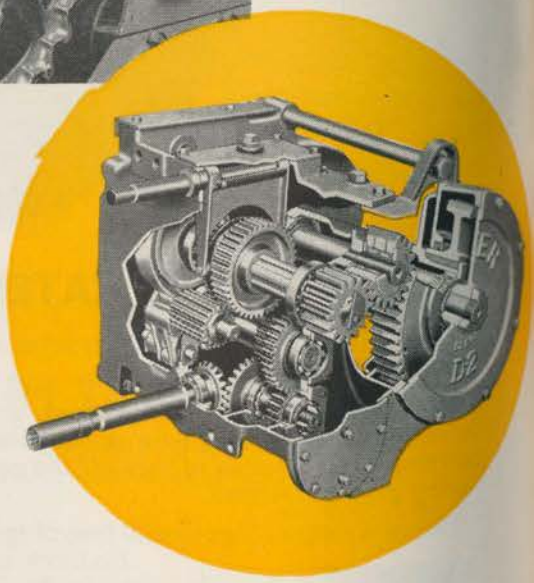
PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

HYSTER D2 TOWING WINCH

FOR "CATERPILLAR" D2 DIESEL TRACTOR

The Hyster D2 Towing Winch is a rugged, direct-geared, reversible winch for "Caterpillar" D2 or R2 Tractors. For logging and towing service of every description.

Power take-off with special mounting parts available at additional cost for combination installation with La Plant-Choate hydraulic bulldozer or trail-builder.



FEATURES

POWERFUL LINE PULL. Up to 12,000 lbs. — 103% greater than drawbar pull.

AMPLE BRAKES. Operating through a gear reduction of 3.5 to 1, the braking power is more than ample for any load.

EASY ON LINE. Large diameter drum barrel and properly formed drum flanges make for longer cable life.

EASY TO OPERATE control levers conveniently located in front of operator's seat. Virtually fingertip control on brake and clutch levers.

REVERSIBLE, SINGLE SPEED, DIRECT GEAR DESIGN. Simple, rugged gearing. Efficient—all shafts turn in anti-friction bearings. Complete oil bath lubrication.

SPECIFICATIONS

Hyster Model — **D2 TOWING WINCH**

Drum size:

Barrel diameter	6″
Flange diameter	15″
Barrel length	14″

Cable capacity, maximum line ..... 400 ft. 5/8″ or 277 ft. 3/4″

(Allowance should be made for loose and unevenly spooled line in towing service.)

Capacity factor "F" 595

Available Line Pulls:

Bare drum	12,000 lbs.
Full drum	5,500 lbs.

Line Speeds:

Bare drum	92 f.p.m.
Full drum	200 f.p.m.

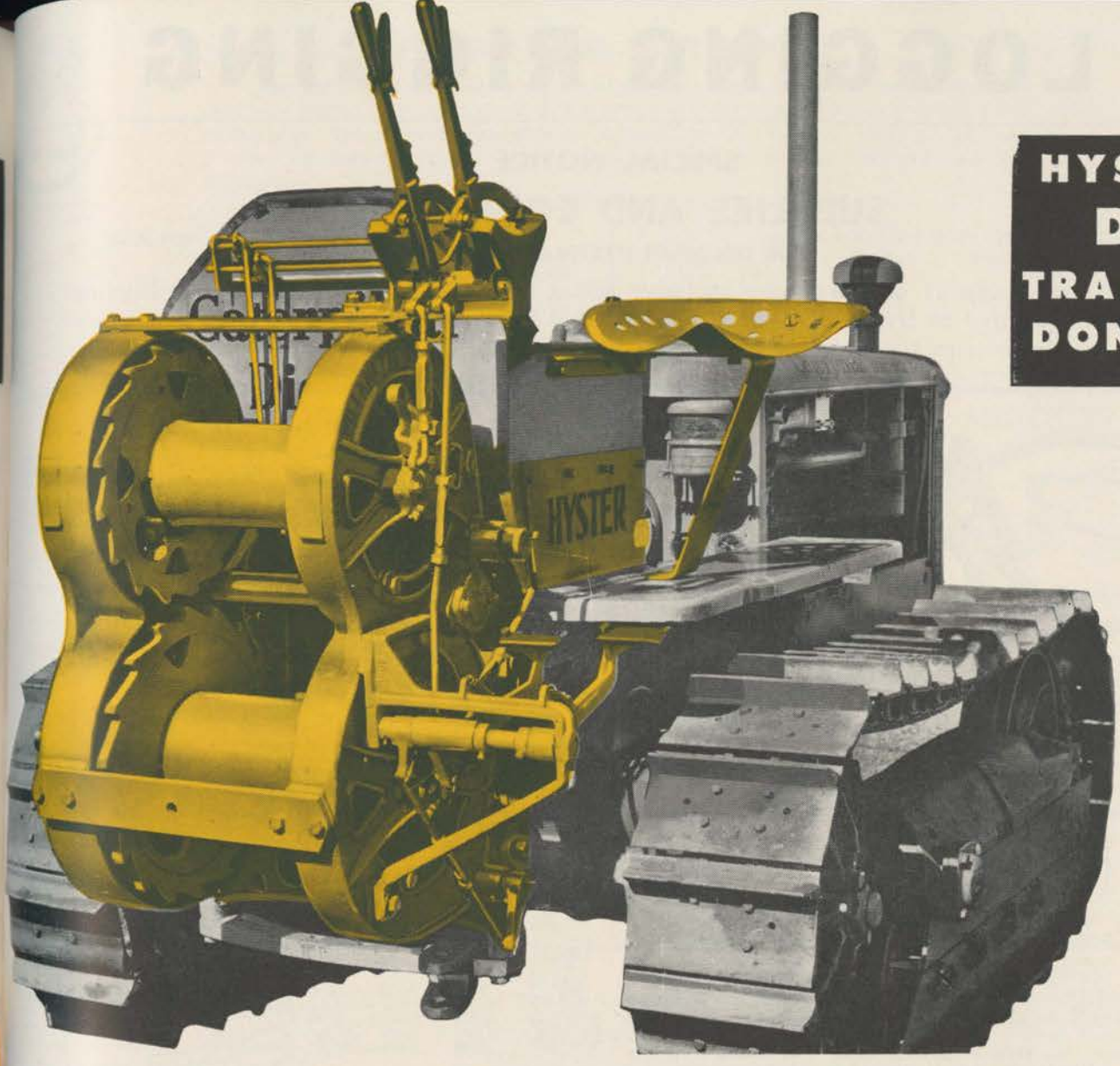
(Line speeds and pulls are the same when overwinding or underwinding.)

Net weight (without cable)	850 lbs.
Domestic shipping weight, approximately	975 lbs.
Code word	DTREW

SPECIAL NOTE: Can be mounted on D2 tractor only when equipped with fender mounted fuel tank and top seat arrangement 5B5050, except that on special order, special parts can be supplied to permit mounting with tank seat. Under these conditions seat is raised and tank hides drum to **some extent.**

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

PORTLAND, OREGON **HYSTER COMPANY** **PEORIA, ILLINOIS**



HYSTER D2 TRACTOR DONKEY

FOR "CATERPILLAR" D2 DIESEL TRACTOR

The HYSTER D2 Tractor Donkey is a double drum, two speed, friction driven hoist for use on the "Caterpillar" D2 or R2 tractor.

Converts tractor into mobile hoisting unit with full tractor mobility.

Quick moves between jobs cuts unproductive time to a minimum.

Gypsy spool available as additional extra item.

Uses include:

DRAGLINE SCRAPER OPERATION
HIGHLEAD LOGGING
LOADING TRUCKS
PILE DRIVING
HOISTING BUILDING MATERIALS

Note: Can be mounted on D2 tractor only when equipped with fender mounted fuel tank and top seat arrangement 5B5050.

SPECIFICATIONS

Hyster Model — **D2 TRACTOR DONKEY**

	Main Drum	Upper Drum
Drum dimensions:		
Barrel diameter	7½"	6"
Flange diameter	17"	14½"
Barrel length	12½	12½"
Cable capacity:		
Maximum line	600 ft. ⅛" or 780 ft. ½"	1,025 ft. ⅜" or 1,500 ft. ⅛"
Capacity factor "F"	720	550
Available Line Pulls:		
Low gear, bare drum	6,700 lbs.	6,200 lbs.
full drum	2,800 lbs.	2,800 lbs.
High gear, bare drum	3,300 lbs.	3,300 lbs.
full drum	1,700 lbs.	1,700 lbs.
Line Speeds:		
Low gear, bare drum	105 f.p.m.	95 f.p.m.
full drum	216 f.p.m.	187 f.p.m.
High gear, bare drum	210 f.p.m.	195 f.p.m.
full drum	430 f.p.m.	375 f.p.m.

Net weight, including transmission and controls..... 1,150 lbs.
Domestic shipping weight, approximately..... 1,200 lbs.
Code word ..... DIDOU

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

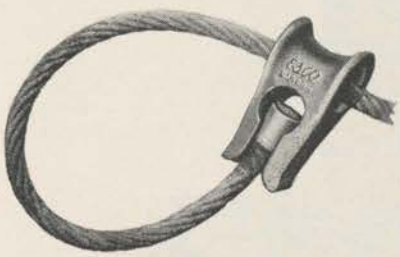
LOGGING RIGGING

SPECIAL NOTICE

SUPPLIES AND EQUIPMENT

FOR USE WITH HYSTER PRODUCTS

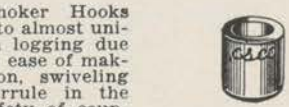
The Hyster Company **does not** have exclusive selling rights on any items of Logging Rigging. Not manufactured by Hyster, these purchased finished items are offered for sale as a service and recommended because they increase Hyster product efficiency.



Bardon Choker Hooks have come into almost universal use in logging due to simplicity, ease of making connection, swiveling action of ferrule in the hook and safety of coupling. The hook slides freely to a tight noose. "Just slip the ferruled end of choker through the hook and it drops back into place ready to pull." It cannot become unhooked while in use, yet can be instantly detached by the operator.

ESCO BARDON CHOKER HOOKS

Part Number	Size	Rope Size	Uses Ferrule Size	Approx. Weight	Code Word
31030	Junior	⅞, 1", 1⅛"	J7, J8, J9	17 lbs.	LIJUN
31031	Light Jr.	⅞, 1", 1⅛"	LJ7, LJ8, LJ9	10 lbs.	LIJCH
31032	Light	½", ⅝", ¾", ⅞"	L4, L5, L6, L7	8 lbs.	LICOH
31033	Bantam	⅜", ½", ⅝"	B3, B4, B5	5 lbs.	BACOH
30544	Midget	⅜" or ½"	M3 or M4	1½ lbs.	MICOH



ESCO Ferrules

ESCO ALLOY STEEL FERRULES

Each size of hook is designed to take several sizes of rope to suit the convenience of user. This necessitates various **rope openings in the ferrules** for each size of hook in order to properly zinc the rope into the ferrule. To avoid confusion in ordering ferrules, we have adopted the following easy system of lettering and numbering the ferrules:

1. For the hook size the first letter of each name is used, as B for Bantam, etc.
2. For the rope size the number of "eighths" in the size of rope is used, as 6 for 6/8 (or ¾" rope).

Part Number	Ferrule Size	Rope Size	Used with Hook Size	Approx. Weight	Code Word
30509	J10	1¼"	Junior	2 lbs.	JUFAR
31011	J9	1⅛"	Junior	2 lbs.	JUFRE
6697	J8	1"	Junior	2 lbs.	JUFEB
8060	J7	⅞"	Junior	2 lbs.	JUFCA
30537	LJ9	1⅛"	Light Jr.	2 lbs.	LJUFR
30536	LJ8	1"	Light Jr.	2 lbs.	LJUFE
30535	LJ7	⅞"	Light Jr.	2 lbs.	LJUFA
7323	L7	⅞"	Light	1½ lbs.	LIFEB
7622	L6	¾"	Light	1½ lbs.	LIFRA
8126	L5	⅝"	Light	1½ lbs.	LIFEL
9574	L4	½"	Light	1½ lbs.	LIHAR
9008	B5	⅝"	Bantam	1 lb.	BAFEB
9009	B4	½"	Bantam	1 lb.	BAFRA
59139	M4	½"	Midget	½ lb.	MIFEB
59140	M3	⅜"	Midget	½ lb.	MIFRA

Arch Line Basket Hook

ESCO BASKET ARCH LINE HOOKS

These hooks are to be shackled to end of arch main line to receive the choker ferrules.

Part Number	Size	Rope Size	Approx. Weight	Code Word
31034	Junior	⅞", 1", 1⅛"	11 lbs.	EBJUH
31035	Light	½", ⅝", ¾", ⅞"	9 lbs.	EBHOK
31124	Bantam	⅜", ½", ⅝"	4 lbs.	EBBAN

Two-Way Arch Line Hook

ESCO TWO-WAY ARCH LINE HOOK

Manganese steel. Is attached to end of arch main line to hold two ferruled end chokers.

Part Number	Size	Rope Size	Approx. Weight	Code Word
31194	Light	½", ⅝", ¾", ⅞"	17 lbs.	ETWHK

ESCO THREE-WAY ARCH LINE HOOK

Manganese steel. Holds three type B-W chokers.

Part Number	Size	Rope Size	Approx. Weight	Code Word
31195	Light	⅝", ¾", ⅞"	16 lbs.	EBTWH
30506	Bantam	⅜", ½", ⅝", ¾"	11 lbs.	EBTBH

BARDON BUTT HOOK

For attaching to end of main line from tractor donkey when decking logs at spar trees. It receives the ferrule of the choker. Also used in connection with butt chain rigging as shown in groups below.

Part Number	Size	Rope Size	Approx. Weight	Code Word
31038	Junior	⅞", 1", 1⅛"	16 lbs.	JUBHK
31037	Light	½", ⅝", ¾", ⅞"	8 lbs.	LIBHK
31036	Bantam	⅜", ½", ⅝",	6 lbs.	BABHK

BARDON BUTT HOOK WITH LINK

With the link cast into the hook, the risk of overheating the hook, while forging link into it, is eliminated.

Part Number	Size	Rope Size	Approx. Weight	Code Word
30518	Junior	⅞", 1", 1⅛"	23 lbs.	JUHWL
30517	Light	½", ⅝", ¾", ⅞"	13 lbs.	LIHWL

For greater flexibility in Hyster Tractor yarder logging to spar tree decks, the use of butt chain rigging is recommended. This usually consists of rigging as shown below, a butt hook, link, swivel and link, connected into a three-way swivel which in turn is connected between main and haul-back lines by means of links and shackles. The number of chain links may be varied as desired by the operator.

BARDON BUTT CHAINS

All manganese steel, cast as one unit and will give several times the wear of ordinary forged chains.

Part Number	Size of Hook	For Wire Rope Sizes	Size of Swivel	Size of Chain	Approx. Weight	Code Word
30521	Junior	1", 1⅛"	1⅜"	1¼"	47 lbs.	JUBUC
30520	Light	¾", ⅞"	1¼"	1"	33 lbs.	LIBUC

ESCO THREE-WAY SWIVEL

All manganese steel, cast in one unit, and furnished with a manganese steel chain link on each end.

Part Number	Sizes	For Rope Sizes	Size of Chain Links	Approx. Weight	Code Word
30524	Junior	1", 1⅛"	1¼x5"	78 lbs.	JUTWS
30523	Light	¾", ⅞"	1 x4"	50 lbs.	LITWS

FORGED STEEL BUTT HOOKS

Straight Eye
Plain Point

These butt hooks are used on the end of the main winch line, when the chokers to be used have spliced eyes or are fitted with Eye Splice Links or Eye Sockets as listed below on this page. The hooks are shaped to accommodate several chokers. The 2½", 2¼" and 2" sizes will take four to six ⅞" or 1" chokers, and the smaller sizes will take four ¾" chokers.

Arrow Point
Straight Eye

Forged from high grade alloy steel, carefully heat-treated.

PLAIN POINT STRAIGHT EYE BUTT HOOKS

Part No.		Size	Weight, Approx.	Code Word
31182	(B)*	2½"	26 lbs.	PPHFB
31118	(B)*	2¼"	20 lbs.	PPHGA
31119	(B)*	2"	14 lbs.	PPHHE
31120	(B)*	1¾"	10 lbs.	PPHKS
31104		1½"	7 lbs.	PPHOX

*Use "B" when eye is desired with a keyway for keyed pin shackle.

ARROW POINT STRAIGHT EYE BUTT HOOKS

Part No.		Size	Weight, Approx.	Code Word
31183	(B)*	2½"	26 lbs.	APBFB
31123	(B)*	2¼"	20 lbs.	APBGA
31007	(B)*	2"	14 lbs.	APBHE
31008	(B)*	1¾"	10 lbs.	APBKS
31009		1½"	7 lbs.	APBOX

*Use "B" when eye is desired with a keyway for keyed pin shackle.

ARCH HOOK SHACKLES

Arch Hook Shackle

Eye-Guard Arch Hook Shackle

ESCO ARCH HOOK SHACKLES

Manganese Steel, With Keyed Pin

For attaching arrow points or plain point butt hooks "B" series to tag chains or to arch main line. The cast manganese steel self-locking keyed pin has no threads to strip.

Part No.	Size	Used with Hook Size	Weight	Code Word
31129	1½"	2½"	13 lbs.	KEPSA
31136	1⅜"	2"	11 lbs.	KEPSC
31127	1¼"	1¾"	7 lbs.	KEPSB

ESCO "EYE-GUARD" ARCH HOOK SHACKLES

Manganese Steel, With Keyed Pin

The bail in this type shackle has enlarged protector guards which prevent damage to eye splices when going over the arch horizontal roll. For attaching butt hook "B" series to main line. The cast manganese steel self-locking keyed pin has no threads to strip.

Part No.	Size	Used with Hook Size	Weight	Code Word
31179	1½"	2½"	15 lbs.	KEPSD
31180	1⅜"	2"	12 lbs.	KEPSF
31181	1¼"	1¾"	8 lbs.	KEPSI

ARCH LINE SHACKLES

Keyed Pin
Arch Line Shackle

Screw-Pin
Arch Line Shackle

ESCO ARCH LINE KEYED PIN SHACKLES

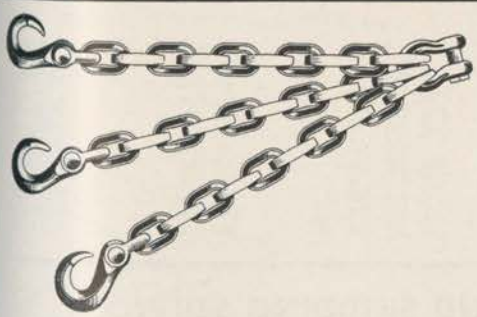
Manganese steel. For connecting tag chains to the arch line, or for connecting basket butt hooks to arch line. The keyed pin has no threads to strip. Self-locking, easy to connect.

Catalog No.	Size	Will Hold	Weight	Code Word
31131	1½"	3 tag chains	16 lbs.	WISKA
31130	1¼"	2 tag chains	9 lbs.	WISKB

ESCO ARCH LINE SCREW PIN SHACKLES

Manganese steel, with heat-treated alloy steel pins.

Part No.	Size	Used with Hook Size	Weight	Code Word
31003	1½"	2½"	18 lbs.	SHATU
31090	1⅜"	2¼"	15 lbs.	SHAUF
31002	1¼"	2"	10 lbs.	SHAQR
31001	1⅛"	1¾"	7 lbs.	SHAEH
30704	1"	1½"	5½ lbs.	SHAOI



ESCO MANGANESE STEEL ARCH TAG CHAINS

Each chain consists of one pear-shape link and as many regular links as shown in list below. **SHACKLE AND HOOK, ALSO ARCH LINE SHACKLE, ARE NOT INCLUDED** but are ordered separately. Usually when three tag chains are to be used, one of each length is ordered so that hooks follow each other over the fairlead roll without bunching.

Part No.	Chain Size	No. of Links	Length	Weight	Code Word
31132	⅞"	9	38¾"	25 lbs.	TACAB
31133	⅞"	11	46¼"	30 lbs.	TACCD
31134	⅞"	13	53¾"	35 lbs.	TACEF
31137	1"	9	41"	33 lbs.	TACKL
31138	1"	11	49"	40 lbs.	TACMN
31139	1"	13	57"	47 lbs.	TACNO

ESCO MANGANESE STEEL HINGE REPAIR LINK

For Repairing Tag Chains

Made of Esco manganese steel with chrome vanadium heat-treated pin. The simplest, most satisfactory chain repair link made.

Part No.	For Chain Size	Weight, Each	Code Word
31142	⅞"	4 lbs.	TARSE
31143	1"	5 lbs.	TAROI

OPEN

CLOSED

ESCO EYE-SPLICE LINKS

Manganese steel. Save wear and tear on choker and main line eye splices, also provide a flexible connection.

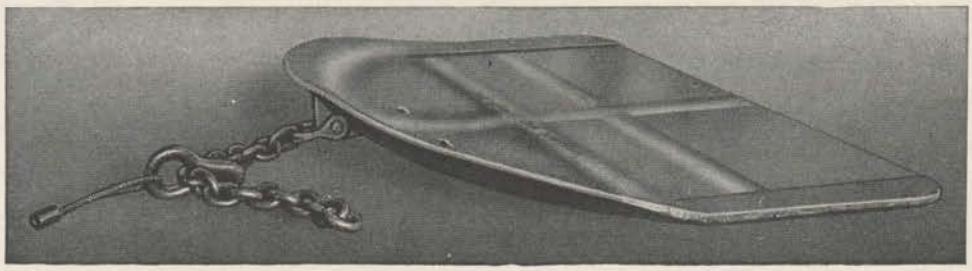
Part No.	Size, Inches	Approx. Weight	Code Word
31196	¾" and ⅞"	5 lbs	EESLS
31197	1" and 1⅛"	9 lbs.	EESLL

ESCO EYE SOCKETS

Manganese steel. Uses only few inches of cable for attaching. Easier to put on hook than eye splice.

Part No.	Rope Size	Approx. Weight	Code Word
30542	⅝", ¾"	4 lbs.	ECESS
30543	⅞", 1"	6 lbs.	ECESL
30547	⅜", ½"	1 lb.	ECEMI

Skidding Pans and Rigging



For Use with All Models of "Caterpillar" Track-Type Tractors

SKIDDING PANS

ESCO MANGANESE STEEL SKIDDING PANS are made of wear-resisting manganese steel, designed to withstand the strenuous service encountered in this type of logging, where striking against stumps, windfalls and rocks occurs and the pan is frequently run over by the tractor when backing and turning. The bottom of the manganese pan soon becomes highly polished in use, reducing the drawbar pull when heavily loaded and speeding up handling. It is sufficiently curved in front to prevent digging in, and when drawn over the same skid road a number of times, will pack and improve the road.

*The 5 ft. x 6 ft. size Skidding Pan has a much higher front, about 12", and is designed particularly for use where roots and undergrowth are apt to catch and hold it.

	Size	Tractor Size	Weight Approx.	Code Word
30507-B	6 ′ x 12′	D8	3,500 lbs.	GRAPN
30508-B	6 ′ x 10′	D8	3,000 lbs.	GRETN
31013-B	6 ′ x 9′	D8	2,300 lbs.	GREPA
31014	6 ′ x 8′	D7	1,780 lbs.	LARPA
31015	4½′ x 6′	D6 and D4	850 lbs.	SMAPA
*31016	*5 ′ x 6′	.....	980 lbs.	MEPAN
31017	3¼′ x 5′	D4 and D2	550 lbs.	LIPAN

Skidding Pans do not include Shackles or Pan Hitches.

PAN HITCHES

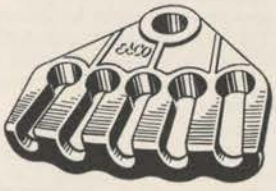
THIS PAN HITCH has the advantage of flexibility, quick adjustability in length, and ease of attachment to tractor by means of a ferruled end which engages in the Bardon 3-Way, 5-Way or 10-Way drawbar hook. The chain can be held by the locking link to any length desired for keeping the pan in the proper position to suit length of chokers and size of logs. It is furnished complete with 3½ ft. of chain and manganese steel shackle.

Part Number	Size Chain	Size Pan	Size Drawbar Hook	Weight Approx.	Code Word
9474AB	1″	6′ x9′	Junior	100 lbs.	PAHEA
9474AC	1″	6′ x9′	Light	100 lbs.	PAHEB
9474AD	1″	6′ x8′ or 5′x6′	Junior	96 lbs.	PAHSC
9474AE	1″	6′ x8′ or 5′x6′	Light	96 lbs.	PAHSD
9475AC	¾″	4½′x6′	Light	70 lbs.	PAHXE
9475AD	¾″	4½′x6′	Bantam	70 lbs.	PAHFF
9475AE	¾″	6′ x8′ or 5′x6′	Bantam	74 lbs.	PAHTG
9475AF	¾″	3½′x5′	Bantam	68 lbs.	PAHTH

BARDON DRAWBAR HOOKS FOR GROUND SKIDDING LOGS

For use with Bardon Chokers having ESCO Ferrules on both ends.

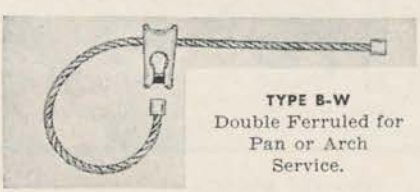
Used principally for ground skidding several poles, logs, stumps, etc., at one time without the necessity of bunching. A choker is attached to each log or piece and hooked on to drawbar hook and the tractor then travels on to the next log. "Easy to connect, just drop the ferrule through the hook." These hooks are made to hold from 3 to 24 chokers, making possible the hauling of many poles or small logs to the load as well as smaller numbers of large logs. The increased capacity is made possible by deeper openings, accommodating two or more chokers in each opening.



Part Number	Hook Capacity and Size	For Rope Sizes	Tractor Size	Weight Approx.	Code Word
31012	3-Way Junior	1″, 1⅛″	D8	54 lbs.	JUTWH
31042	3-Way Light	¾″, ⅞″, 1″	D8, D7, D6	31 lbs.	LITWH
31043	5-Way Light	¾″, ⅞″, 1″	D8, D7, D6	62 lbs.	VIHOK
31044	5-Way Bantam	½″, ⅝″	D6, D4	43 lbs.	THOOK
31101	5-Way Bantam Special	½″, ⅝″	D2	42 lbs.	THOBT
31045	7-Way Light	¾″, ⅞″, 1″	D8, D7, D6	68 lbs.	SELHK
31046	10-Way Light	¾″, ⅞″, 1″	D8, D7, D6	83 lbs.	VIHAT
31048	10-Way Bantam	½″, ⅝″	D6, D4, D2	74 lbs.	VIHBT
30512	15-Way Light	¾″, ⅞″, 1″	D8, D7, D6	140 lbs.	VIHCW
30513	24-Way Light	¾″, ⅞″, 1″	D8, D7, D6	200 lbs.	VIHDX

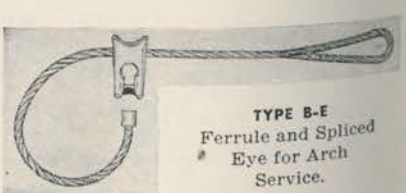
ASSEMBLED CHOKERS FOR LOGGING ARCH AND SKIDDING SERVICE

Two types of chokers are listed, both fitted with Bardon Hooks. Type B-W has ferrules on both ends, especially adapted for use with Bardon Drawbar Hooks and for Arches using Bardon Butt Hooks on tag lines. Type B-E has spliced eye on one end for use with regular butt hook.



TYPE B-W
Double Ferruled for Pan or Arch Service.

Hyster Chokers are made of 6x19 filler wire construction, I.W.R.C. improved Plow Steel Non-Preformed Rope. Lengths listed are finished lengths of chokers. On spliced eyes it requires 4 to 5 feet of extra rope to make eye-splice and this is included in prices.



TYPE B-E
Ferrule and Spliced Eye for Arch Service.

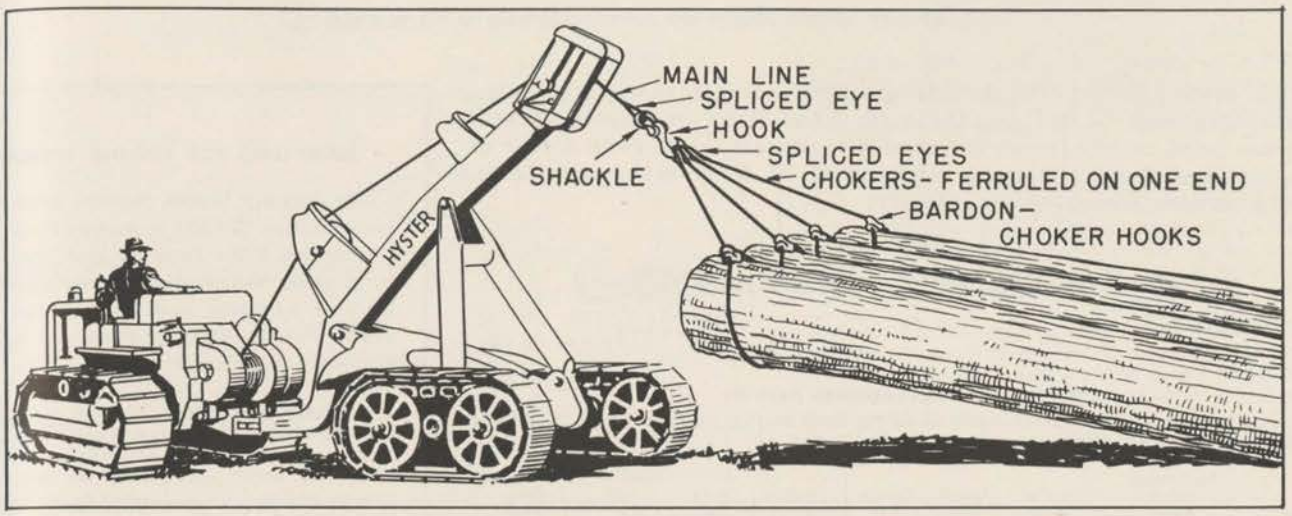
TYPE B-W

Part Number	Size	Size of Ferrule	Weight Approx.	Code Word
31070AC	1″ x 18′	J8	38 lbs.	RICRT
31062AB	⅞″ x 16′	L7	30 lbs.	RICPG
31056AC	¾″ x 16′	L6	24 lbs.	RICOP
31052AB	⅝″ x 10′	B5	13 lbs.	RICNL
31050AB	½″ x 10′	B4	10 lbs	RICMH

TYPE B-E

Part Number	Size	Size of Ferrule	Weight Approx.	Code Word
31071AC	1″ x 18′	J8	44 lbs.	RIDCA
31063AB	⅞″ x 16′	L7	35 lbs.	RIDBL
31057AC	¾″ x 16′	L6	28 lbs.	RIDAX
31053AB	⅝″ x 10′	B5	15 lbs.	RIDAO
31051AB	½″ x 10′	B4	12 lbs.	RIDAH

RIGGING . . . FOR LOGGING ARCHES AND SULKIES



The simplest and most widely used system of arch or sulky rigging is illustrated in the sketch above. The complete rigging for each size is listed in the sets below.

SET R-100 FOR HYSTER D8N WINCH AND ARCH

1 No. 141R-75. Main line, 1⅛", 6x19 Seale improved Plow Steel Preformed Wire Rope, IWRC, 75 feet long, with ferrule for attaching to drum on one end and spliced eye on other end with No. 31179, 1½" Manganese Steel Eye Guard Shackle and No. 31182, 2½" plain point Butt Hook.

12 No. 31071AC, 1"x18', Type B.E. Chokers.

Shipping weight, approx. 660 lbs.

Code word ..... SIBES

SET R-101 FOR HYSTER D7N WINCH AND ARCH

1 No. 142R-75. Main line, 1", 6x19 Seale improved Plow Steel Preformed Wire Rope, IWRC, 75 feet long, with ferrule for attaching to drum on one end and spliced eye on other end with No. 31180, 1⅜" Manganese Steel Eye Guard Shackle and No. 31118, 2¼" plain point Butt Hook.

12 No. 31057AC, ¾"x16', Type B.E. Chokers.

Shipping weight, approx. 510 lbs.

Code word ..... SIBSS

SET R-102 FOR HYSTER D6N WINCH AND ARCH

1 No. 144R-50, ⅞", 6x19 Seale improved Plow Steel Preformed Wire Rope, IWRC, 50 feet long, with ferrule for attaching to drum on one end with No. 31181, 1¼" Manganese Steel Eye Guard Shackle and No. 31119, 2" plain point Butt Hook.

12 No. 31057AC, ¾"x16' type B.E. Chokers.

Shipping weight, approx. 430 lbs.

Code word ..... SIBXX

SET R-118 FOR HYSTER D4 WINCH AND SULKY

1 No. 145R-50. Main line, ¾", 6x19 Seale construction improved Plow Steel Preformed Wire Rope, IWRC, 50 feet long, with ferruled end for attaching to drum and spliced eye for shackle with No. 30704, 1" Wide Bell Manganese Steel Shackle and No. 31009, 1½" Arrow Point Butt Hook.

6 No. 31053AB, ⅝"x10' Type B.E. Chokers.

Shipping weight, approx. 160 lbs.

Code word ..... SIBFO

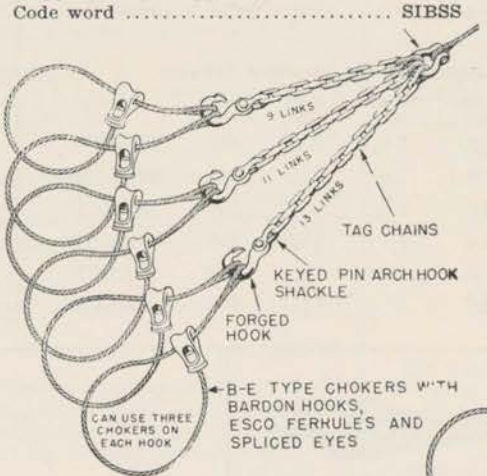
SET R-119 FOR HYSTER D2 WINCH AND SULKY

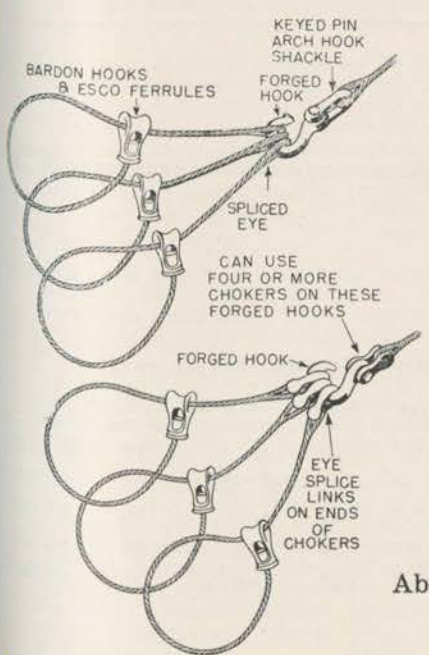
1 No. 147-R-50. Main line, ⅝", 6x19 Seale construction improved Plow Steel Preformed Wire Rope, IWRC, 50 feet long, with ferruled end for attaching to drum and spliced eye for shackle with No. 30704, 1" Wide Bell Manganese Steel Shackle and No. 31009, 1½" Arrow Point Butt Hook.

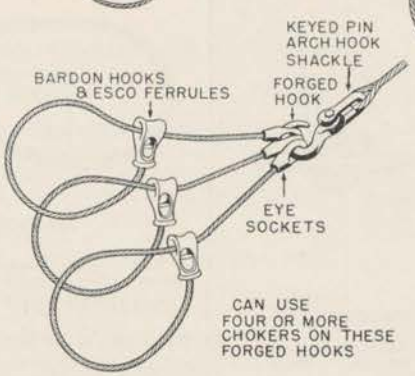
6 No. 31051AB, ½"x10', Type B.E. Chokers.

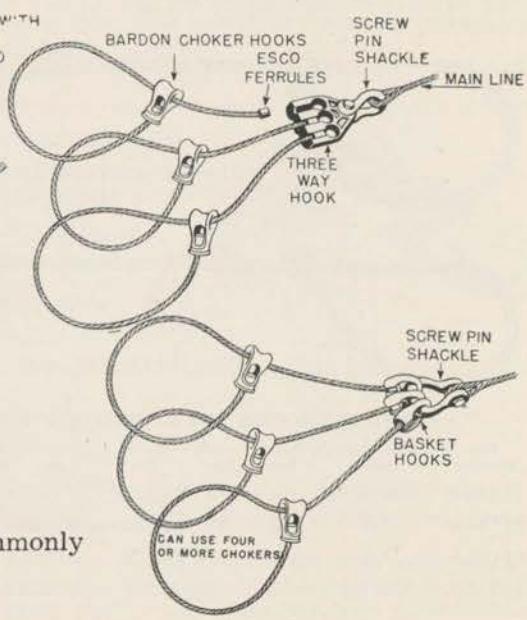
Shipping weight, approx. 135 lbs.

Code word ..... SIBRT







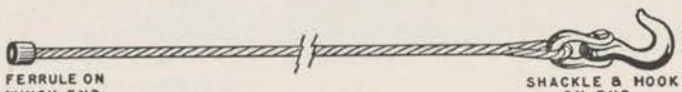


Above sketches illustrate the most commonly used systems of arch rigging.

CHOKERS AND MAIN LINES for Logging and Land Clearing

SPECIFY WINCH MODEL ON WHICH RIGGING IS TO BE USED

NOTE. In the following table the catalog number indicates the length of the line, the figures following the "R" being the length in feet. When ordering lengths other than those listed, simply change the number to indicate length desired. (For example, the 1-inch line 75 feet long is listed as 142R-75. To order the same size line 150 feet long, use a catalog number 142R-150).



MAIN LINES FOR LOGGING SERVICE

Sizes as used in our complete Arch Logging Sets shown on first page; also other lengths for ground skidding.

Part Number	For Towing Winch Model	Size of Rope	Length Feet	Ferrule Size	Shackle Size	Hook Size	Approx. Weight Lbs.	Code Word
140R-50	D8N	1¼"	50	J10	1½"	2½"	180	MALIQ
141R-75	D8N, D7N	1⅛"	75	J9	1½"	2½"	195	MALIE
142R-75	D8N, D7N	1 "	75	J8	1⅜"	2¼"	155	MALIN
143R-100	D7N	⅞"	100	J7	1¼"	2 "	145	MALSE
144R-50	D6N-D4	⅞"	50	L7	1¼"	2 "	85	MALSA
145R-50	D6N-D4	¾"	50	L6	1 "	1½"	65	MALTQ
146R-50	D4	⅝"	50	L5	1 "	1½"	48	MALFE
147R-50	D2	⅝"	50	B5	1 "	1½"	48	MALFT
149R-50	D2	½"	50	B4	⅞"	1¼"	36	MALHA

MAIN LINES FOR LAND CLEARING AND GENERAL TOWING SERVICE

Part Number	For Towing Winch Model	Size of Rope	Length Feet	Ferrule Size	Shackle Size	Hook Size	Approx. Wt. lbs.	Code Word
141R-200	D8N	1⅛"	200	J9	1½"	2½"	445	MALCA
142R-200	D7N	1 "	200	J8	1⅜"	2¼"	355	MALCB
143R-250	D7	⅞"	250	J7	1¼"	2 "	330	MALCD
145R-250	D6	¾"	250	L6	1 "	1½"	245	MALCE
146R-250	D4	⅝"	250	L5	1 "	1½"	174	MALCF
148R-250	D2	9/16"	250	B5	1 "	1½"	143	MALCG

MAIN LINES FOR TOWING WINCHES

For Towing Winch Service 6x19 Seale construction *IWRC Improved Plow Steel Preformed Wire Rope is best, since the large outer wires offer maximum resistance to abrasion and because the wire center resists crushing when not spooled perfectly on the drum.

The main lines listed at the left are made of the above described cable and are fitted with a ferrule on one end for attaching to the drum of the size winch indicated in list and with a shackle and butt hook attached to eye splice on the outer end, as sketched.

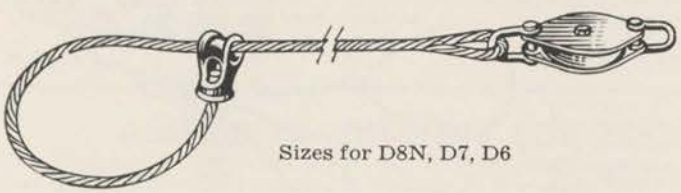
The shortest line practicable for the job should always be used, not only for economy in cost but also so that the line takes off from the drum as close to the barrel as practical where maximum pull is developed.

For towing over bad ground longer lines are often required to be able to reach firm footing or anchorage.

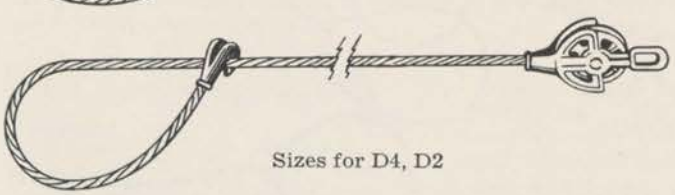
MAIN LINES FOR TRACTOR DONKEYS

For tractor donkey service 6x19 Seale construction *IWRC Improved Plow Steel Non-Preformed wire rope is recommended. In most tractor donkey work the maximum drum capacity length of cable is used.

*6x19 IWRC (independent wire rope center). Improved Plow Steel Preformed or Non-preformed wire rope is made of six strands of 19 wires each laid in either "Seale Patent" or "Filler Wire" construction with wire center.



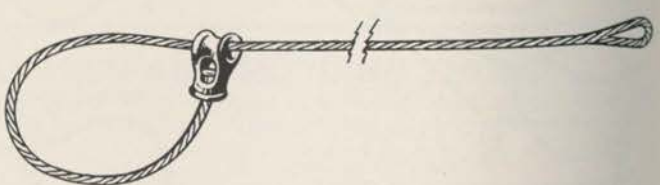
Sizes for D8N, D7, D6



Sizes for D4, D2

POWER CHOKERS FOR LAND-CLEARING TACKLE

Part Number	For Winch Model	Rope Size	Length Feet	Hook Size	Block No.	Approx. Wt. lbs.	Code Word
31166A	D8N, D7N	1¼"	18	Stand.	31165A	188	PCEAS
31155A	D7	1⅛"	18	Lt. Jr.	31165A	161	PCSEV
31152A	D6	1 "	18	Lt. Jr.	31165A	153	PCSIX
31146A	D4-D2	⅞"	16	31160	31164A	65	PCSMA

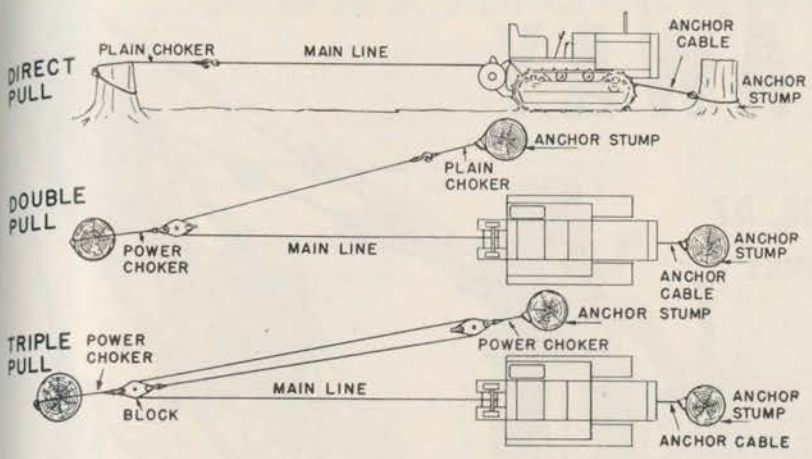


ANCHOR CABLES FOR LAND-CLEARING TACKLE

Part Number	For Winch Model	Rope Size	Length Feet	Hook Size	Approx. Wt. lbs.	Code Word
30526A	D8N	1⅛"	28	Lt. Jr.	76	ACATE
31157A	D7N	1 "	28	Lt. Jr.	64	ACSVN
31081A	D7	⅞"	28	Light	50	ACSEV
31151A	D6N	¾"	24	Light	36	ACSIX
31053AK	D4-D2	⅝"	22	Bantam	23	ACSMA

HYSTER LAND CLEARING TACKLE

FOR USE WITH HYSTER EQUIPPED "CATERPILLAR" TRACK-TYPE TRACTORS



A Hyster Towing Winch, mounted on a tractor is far superior to any other method for pulling stumps. It not only pulls the stumps, but piles stumps and brush for burning, skids logs to loading points and does the "complete job."

The drawing at the left shows single, double and triple hitch hook-ups, all available with a winch and the tackle listed below. Triple power hitch exerts a tremendous force and the complete rigging and pulling of a 20-inch stump is less than a 5-minute job, and the unit moves itself from job to job.

Hyster Tackle Sets are complete with main line, chokers and anchor cables. Two power chokers are provided for triple hitch service, and 3 plain chokers so stumps can be rigged ahead ready to hook to main line. A tractor anchor cable is also provided. The sets are made up with equipment of ample strength for the power of each tractor.

SET R-107 LAND CLEARING TACKLE for D8L, D8N and D8 HYSTER TOWING WINCHES

1 No. 141R-200. Main Cable, 200 ft. 1⅛" improved Plow Steel Preformed Wire Rope, 6x19 Seale, IWRC, with forged steel hook attached by shackle to eye splice at one end, ferrule for attaching to drum on other end.
3 No. 31071AC, 1"x18' Type BE Chokers.
1 No. 30526A Anchor Cable, 1⅛"x28', Type BE Choker.
2 No. 31166A Power Chokers, 1¼"x18', Type BE Chokers with No. 31165A heavy ball bearing blocks attached to eye splices.
Weight, approx.....1,050 lbs. Code word.....LACEI

SET R-132 LAND CLEARING TACKLE for the D7N HYSTER TOWING WINCH

1 No. 142R-200. Main Cable, 200 ft. 1" improved Plow Steel Preformed Wire Rope, 6x19 Seale, IWRC, with forged steel hook attached by shackle to eye splice at one end, ferrule for attaching to drum on other end.
3 No. 31071AC, 1"x18' Type BE Chokers.
1 No. 31157A Anchor Cable, 1"x28', Type BE Choker.
2 No. 31166A Power Chokers, 1¼"x18', Type BE Chokers with No. 31165A heavy ball bearing blocks attached to eye splices.
Weight, approx.....950 lbs. Code word.....LACFK

SET R-108 LAND CLEARING TACKLE for the D7 HYSTER TOWING WINCH

1 No. 143R-250. Main Cable, 250 ft. ⅞" improved Plow Steel Preformed Wire Rope, 6x19 Seale, IWRC, with forged steel hook attached by shackle to eye splice at one end, ferrule for attaching to drum on other end.
3 No. 31063AB, ⅞"x16' Type BE Chokers.
1 No. 31081A Anchor Cable, ⅞"x28', Type BE.
2 No. 31155A Power Chokers, 1⅛"x18', Type BE Chokers with No. 31165A heavy ball bearing blocks attached to eye splices.
Weight, approx.....865 lbs. Code word.....LACSE

SET R-129 LAND CLEARING TACKLE for the D6N HYSTER TOWING WINCH

1 No. 145R-250. Main Cable, 250 ft. ¾" improved Plow Steel Preformed Wire Rope, 6x19 Seale, IWRC, with forged steel hook attached by shackle to eye splice at one end, ferrule for attaching to drum on other end.
3 No. 31057AC, ¾"x16' Type BE Chokers.
1 No. 31151A Anchor Cable, ¾"x24', Type BE.
2 No. 31152A Power Chokers, 1"x18', Type BE Chokers with No. 31165A heavy ball bearing blocks attached to eye splices.
Weight, approx.....760 lbs. Code word.....LCTDS

SET R-130 LAND CLEARING TACKLE for the D4 and D4N HYSTER TOWING WINCH

1 No. 146R-250. Main Cable, 250 ft. ⅝" improved Plow Steel Preformed Wire Rope, 6x19 Seale, IWRC, with forged steel hook attached by shackle to eye splice at one end, ferrule for attaching to drum on other end.
3 No. 31053AB, ⅝"x10' Type BE Chokers.
1 No. 31053AK Anchor Cable, 22 ft. ⅝", Type BE.
2 No. 31146A Power Chokers, each 16 ft. ⅞" Plow Steel Wire Rope with choker hooks and No. 31164A power pulley blocks attached.
Weight, approx.....335 lbs. Code word.....LCTFP

SET R-131 LAND CLEARING TACKLE for the D2 HYSTER TOWING WINCH

1 No. 148R-250. Main Cable, 250 ft. 1/16" improved Plow Steel Preformed Wire Rope with forged steel hook attached by shackle to eye splice on one end, ferrule for attaching to drum on other end.
3 No. 31051AB, ½"x10' Type BE Chokers.
1 No. 31053AK Anchor Cable, 22 ft. ⅝", Type BE.
2 No. 31146A Power Chokers, each 16 ft. ⅞" Plow Steel wire rope with choker hooks and No. 31164A power pulley blocks attached.
Weight, approx.....300 lbs. Code word.....LCTWX

Any of the items shown in the complete sets at the left may be ordered separately by catalog number.

BALL BEARING POWER PULLEY BLOCK

No. 31165A. A powerful block, taking up to 1⅛" wire rope. Complete with shackle on each end.
Weight 105 lbs. Code word.....BABPB

PLAIN BEARING POWER PULLEY BLOCK

No. 31164A. For use with smaller sets. Takes up to ⅝" wire rope. Has socket in frame for babbitting rope to block.
Weight 32 lbs. Code word.....PLABL

ROOT HOOK

No. 31149. Extra heavy steel. While not included in land clearing sets, it has great value when a lot of stump pulling is required.
Weight 90 lbs.
Code ..... ROTHK

SOCKET TYPE CHOKER HOOKS

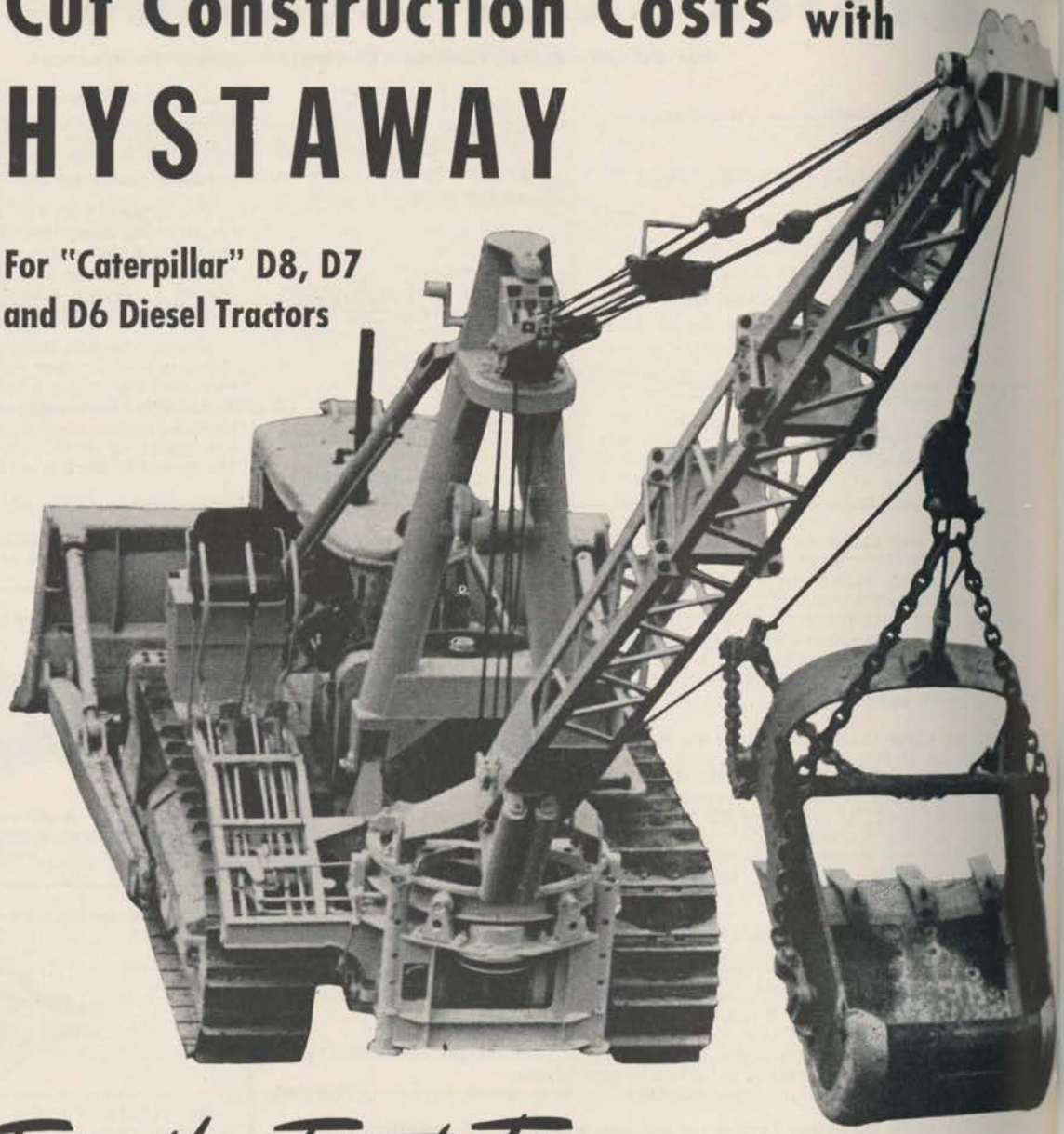
Used on the smaller size chokers in land clearing sets.

No. 31160. For ⅞" or ¾" rope, wt. 8 lbs. Code STCLA
No. 31159. For ⅝" rope, weight 6 lbs. Code STCME
No. 31158. For ½" or 7/16" rope, wt. 3 lbs. Code STCSM

Cut Construction Costs with HYSTAWAY

HYSTER HYSTAWAY

For "Caterpillar" D8, D7 and D6 Diesel Tractors



For the First Time *A utility machine combining* **DRAGLINE CLAMSHELL CRANE** *with "Caterpillar" Track-Type Tractor and Bulldozer*

All in One Working Unit *Full oscillating tractor or rigid tractor at the turn of a crank . . . plus quick and easy installation and removability.* Designed for fast and easy installation or removal, the HYSTAWAY can be removed from the tractor to free it for other work in less than one hour (after initial installation) by two men and reinstalled in two hours. A dragline this morning: a bulldozer this afternoon.

PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

HYSTAWAY LIFTING CRANE WORKING RANGES

HYSTER HYSTAWAY

These lifting capacities are approximately 75% of tipping loads when tractor is equipped with a bulldozer of average weight, operating on firm ground, equipped with standard length boom indicated (deduct or add about 200 pounds for each 5 foot increase or decrease in boom length) with track stabilizer locked and with chocks to bring rear-boom capacity up to capacity at sides.

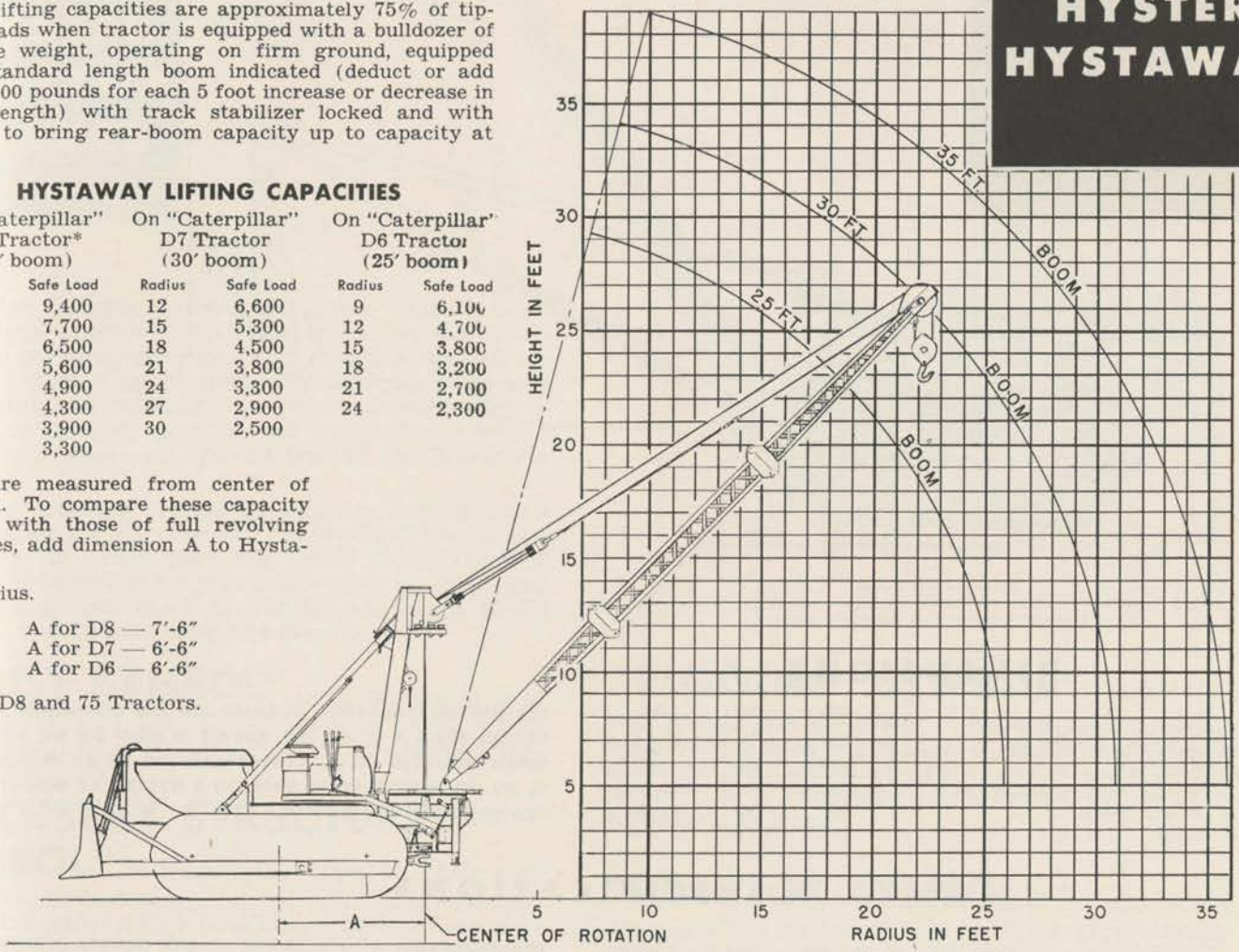
HYSTAWAY LIFTING CAPACITIES

On "Caterpillar" D8 Tractor* (35′ boom)		On "Caterpillar" D7 Tractor (30′ boom)		On "Caterpillar" D6 Tractor (25′ boom)	
*Radius	Safe Load	Radius	Safe Load	Radius	Safe Load
12	9,400	12	6,600	9	6,100
15	7,700	15	5,300	12	4,700
18	6,500	18	4,500	15	3,800
21	5,600	21	3,800	18	3,200
24	4,900	24	3,300	21	2,700
27	4,300	27	2,900	24	2,300
30	3,900	30	2,500		
35	3,300				

Radii are measured from center of rotation. To compare these capacity ratings with those of full revolving machines, add dimension A to Hystaway radius.

A for D8 — 7′-6″
A for D7 — 6′-6″
A for D6 — 6′-6″

*Also RD8 and 75 Tractors.

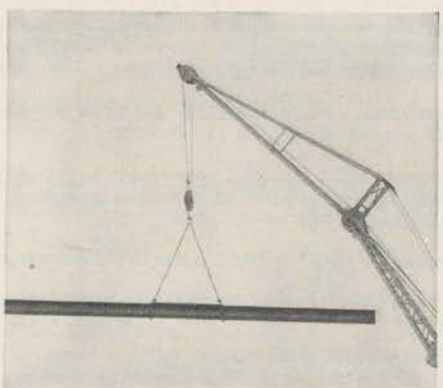


OPTIONAL EQUIPMENT

ESCO DRAGLINE BUCKETS . . . TAGLINE . . . JIB BOOM . . . BOOM EXTENSION SECTIONS . . . COUNTERWEIGHT GROUPS . . . BRACKETS FOR SPECIAL BULLDOZERS

Esco manganese steel dragline buckets available through Hyster distributors.

Where bulldozer is not used, counterweight groups can be supplied for attaching to Hystaway track brackets. Weight pattern is furnished for local castings. D7 tractor should be equipped with top starting crank group when counterweights are used.



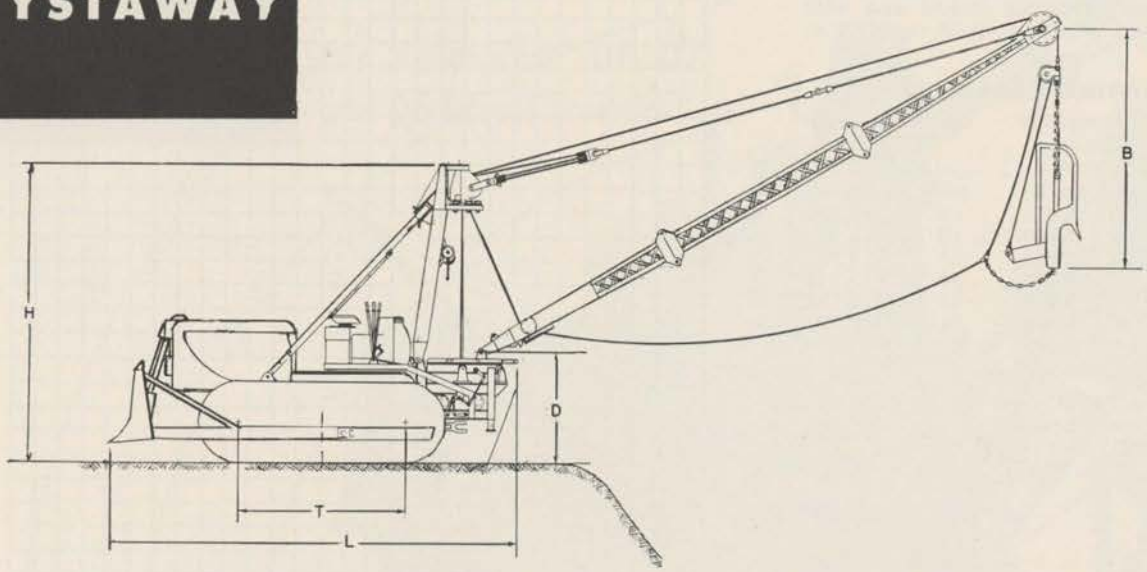
15-foot Jib Boom Attachment fittings for use with 35-foot boom. Available for 25 and 30-ft. boom on special order.

Safe Lifting Capacities With 15-ft. Jib on 35-ft. Boom

	Capacity	
Radius	*D8*	*D7*
20	5,300	3,200
24	4,300	2,500
28	3,600	2,000
32	3,000	1,500
36	2,600	1,100
Correction Factor	600	800

HYSTAWAY DRAGLINE

HYSTER HYSTAWAY



DIMENSIONS

	D8	D7	D6
Recommended bucket size	½ yd.	½ yd.	⅜ yd.
B Approximate bucket allowance	8′ to 9′	8′ to 9′	7′ to 8′
D Heel pin height	63″	59″	54″
T Tractor bearing length	8′-2″	7′-9″	7′-1″
L Length overall	23′	19′	18′-6″
H Height	14′-5″	13′-4″	11′-11″

THE HYSTER WARRANTY IS BASED ON THE CONDITION THAT NO LARGER THAN A ½ CU. YD. BUCKET IS USED ON THE HYSTAWAY WHEN MOUNTED ON A "CATERPILLAR" D8 OR D7 TRACTOR OR A ⅜ CU. YD. BUCKET WHEN USED ON A HYSTAWAY MOUNTED ON A "CATERPILLAR" D6 TRACTOR.

SPECIFICATIONS

The Hystaway is made for use on three sizes of "Caterpillar" track-type tractors . . . models D8 and D7 with a ½-yd. bucket and the D6 with a ⅜-yd. bucket. Limited stability of the D6 makes use of a bucket larger than ⅜ cu. yd. impractypical on this tractor in most cases. The Hystaway base unit is the same for all sizes.

CLUTCHES: Four identical internal expanding band clutches, 16″ diameter, 2½″ x ¼″ facing.

DRUMS: 10″ diameter, removable lagging, 15″ flange diameter. Ball bearing-mounted for free spooling. Cable capacity at 3 wraps, 130 ft. of ½″ rope.

BRAKES: 18½″ x 2½″ external contracting band. ¼″ lining.

BOOM HOIST: Power driven, self-locking worm with drag brake. 7″ diameter drum. ½″ 6-part line.

BOOM: Butt type splice, lattice construction. 15-ft. base and 10-ft. tip sections. Intermediate sections 10 ft. and 5 ft. 16″ sheaves. Fairlead for dragline work included.

SWING: 120 degrees each side of center. Automatic stop. Turn table speed 4.5 r.p.m. Clutch controlled bevel gears.

POWER: Taken from power take-off of tractor.

SWING LOCK: Pawl engages bull gear at any position.

LUBRICATION: Ordnance type Alemite throughout.

CONTROLS: Conventional leverbank. Adjustable seat. Large tool box under seat.

TRANSMISSION: All shafts run on anti-friction bearings in oil bath. Heat treated alloy gears throughout. Sliding gear on power take-off shaft disengages transmission when Hystaway is not in use.

BEARINGS: Bull pinion, sheaves, rolls and boom hoist on bronze bushings. All other gears and shafts on anti-friction bearings.

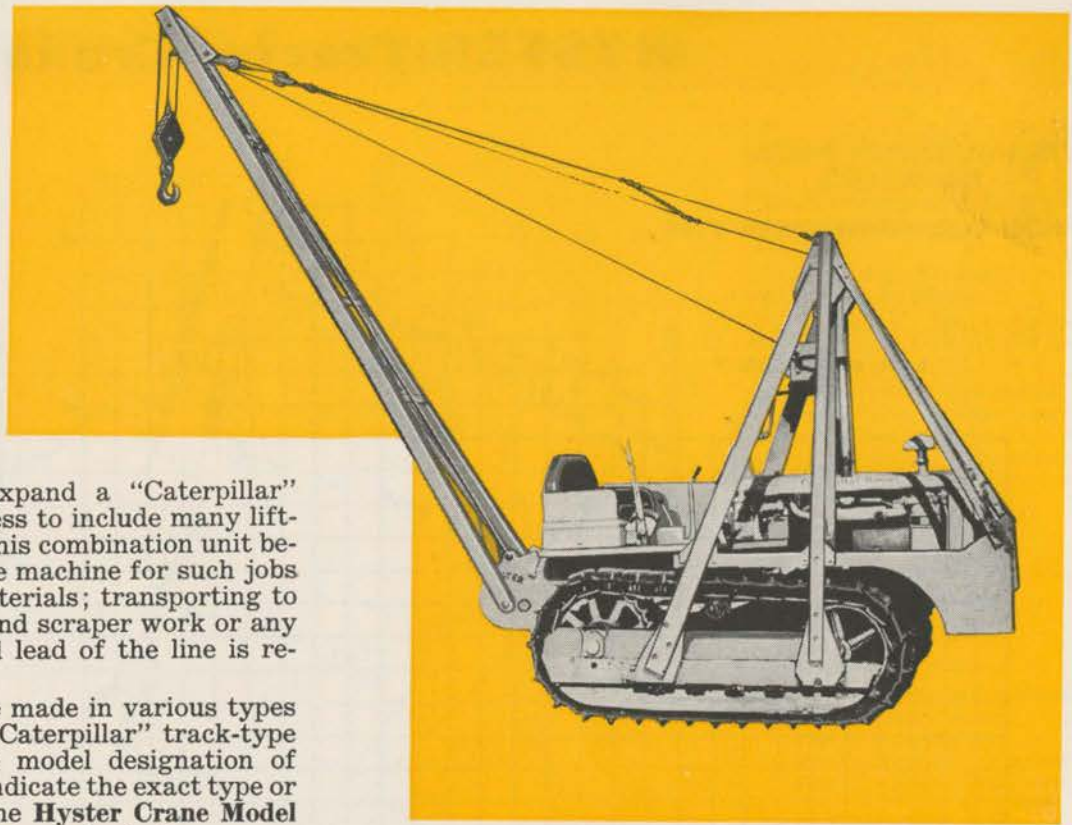
	D8	D7	D6
Line Pull, 10″ Lagging	9000 lbs.	9000 lbs.	9000 lbs.
Line Speed, 10″ Lagging	160 f.p.m	160 f.p.m.	160 f.p.m.
Approx. Shipping Weight	10,950	9,770	9,040
Boom Length (Standard)	35′	30′	25′
Recommended Dragline Bucket Size	½	½	⅜
Recommended Rehandling Clamshell Bucket	½	½	⅜
Recommended Digging Clamshell Bucket	⅜	⅜	¼

INSTALLATION WITH OTHER TRACTOR EQUIPMENT: The Hystaway can be installed on D8, D7, D6 Standard Gauge or D6 Wide Gauge "Caterpillar" tractors equipped with any make of bulldozer; with Traxcavator, or with counterweights. Standard Hystaway track brackets can be used in most cases but a few bulldozers require special brackets.

TRACK SHOES: We recommend using the widest track shoes that will clear the bulldozer and provide brackets that will admit such shoes in practically all cases.

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

HYSTER TRACTOR CRANES



Hyster Tractor Cranes expand a "Caterpillar" track-type Tractor's usefulness to include many lifting and carrying services. (This combination unit becomes a very efficient, mobile machine for such jobs as loading and unloading materials; transporting to and from storage; dragline and scraper work or any other jobs where an upward lead of the line is required.)

Hyster Tractor Cranes are made in various types and models for all sizes of "Caterpillar" track-type Tractors. In order that the model designation of Hyster Tractor Cranes may indicate the exact type or design, a system based on the **Hyster Crane Model Designation Chart** below has been devised.

"HOIST SYMBOL" indicates the type of winch to be used, i.e. "T" for Towing Winch, Worm Drive Winch, or Utility Winch; "D" for Double Drum or Tractor Donkey.

"BACKSTAY STRUCTURE SYMBOL" indicates the type of back stay structure or fastening, i. e. "C" for counterweight type. It includes a high back stay frame and counterweight boxes which fasten to the front of the track-frames; "L" for low type back stay frames which fasten to the front of the track frames; "B" for back stays that may be fastened or anchored to existing structures of certain bulldozers or front-lift shovels. Refer to specification chart, column 6, page 34.

"RIGGING SYMBOL" indicates whether or not the crane is to be equipped with a boom that is fixed or one that can be raised or lowered either with a hand winch or the top drum of a tractor donkey, i.e. "F" indicates a fixed boom; "A" indicates an adjustable boom.

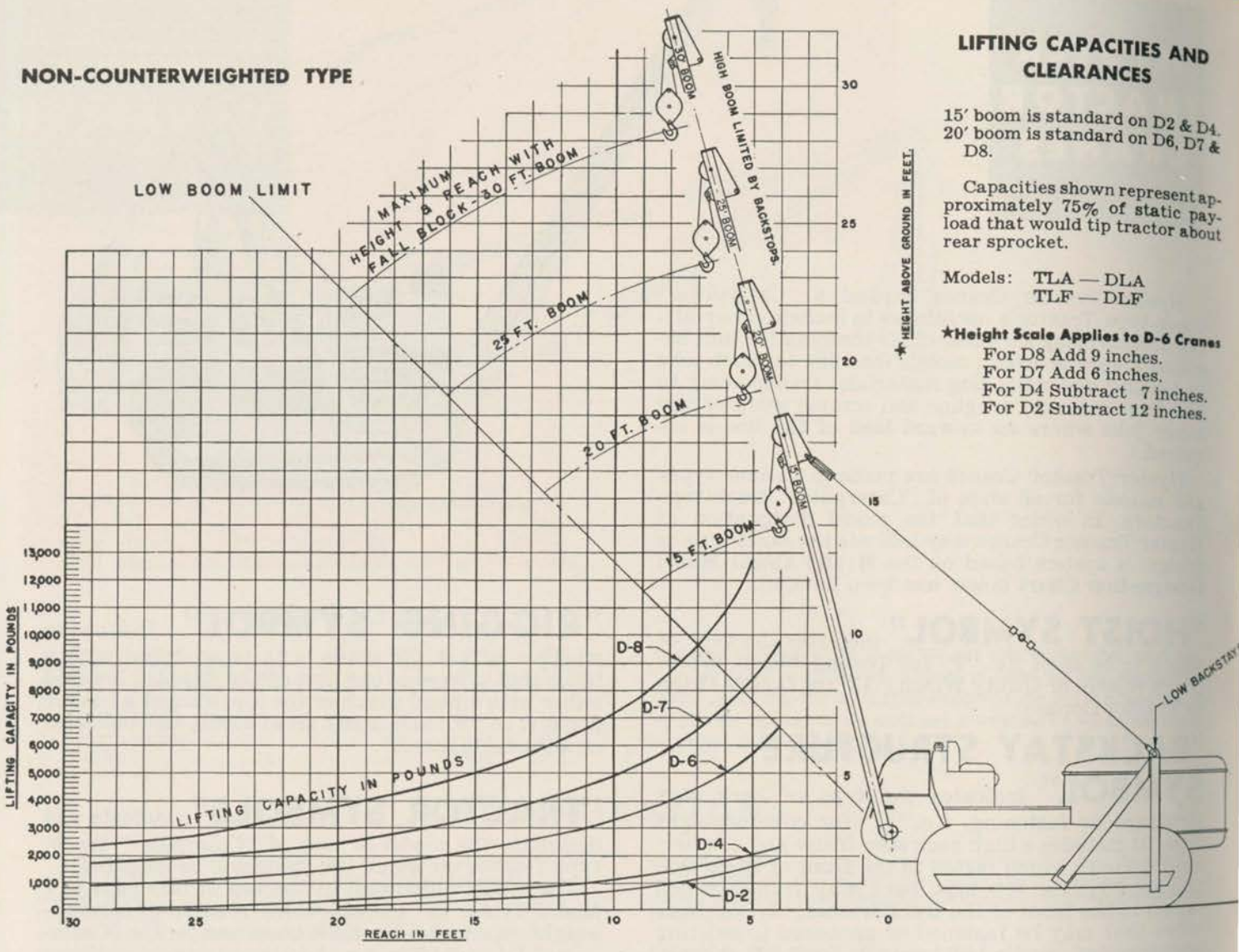
"TRACTOR SYMBOLS" indicate and designate the model or size of "Caterpillar" track-type Tractor on which the crane will be mounted.

The model illustrated at the top of this page is a Model TCA4, i.e. towing winch mounting, counterweight type with adjustable boom and for the "Caterpillar" D4 or R4 Tractor. Additional models are illustrated as examples on the following pages.

HYSTER CRANE MODEL DESIGNATIONS

HOIST SYMBOL	BACKSTAY STRUCTURES SYMBOL	RIGGING SYMBOL	TRACTOR SYMBOL
T — TOWING, WORM DRIVE OR UTILITY WINCH	C — COUNTERWEIGHT TYPE	F — FIXED BOOM (NO ADJUSTMENT)	8 FOR D8
			7 FOR D7
D — DOUBLE DRUM	L — LOW TYPE	✲ A — ADJUSTABLE BOOM (WITH CRAB DRUM & BLOCKS)	6 FOR D6
	B — BULLDOZER OR TRAXCAVATOR SERVES		4 FOR D4 OR R4
✲ WHEN USED WITH DOUBLE DRUM, CAN BE CONVERTED IN FIELD TO LIVE BOOM ARRANGEMENT WITH TOPPING LINE ON UPPER DRUM			2 FOR D2 OR R2

NON-COUNTERWEIGHTED TYPE



LIFTING CAPACITIES AND CLEARANCES

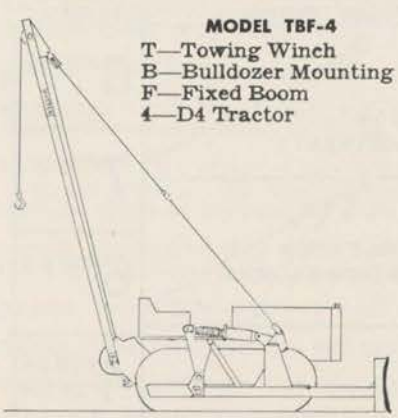
15′ boom is standard on D2 & D4.
20′ boom is standard on D6, D7 & D8.

Capacities shown represent approximately 75% of static payload that would tip tractor about rear sprocket.

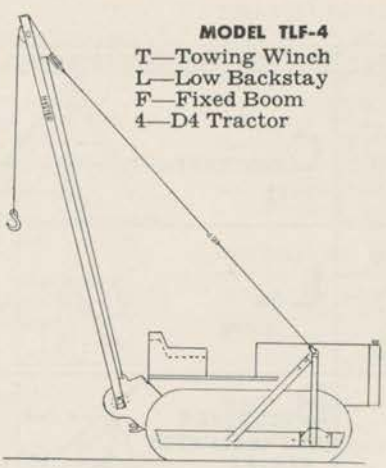
Models: TLA — DLA
TLF — DLF

★Height Scale Applies to D-6 Cranes
For D8 Add 9 inches.
For D7 Add 6 inches.
For D4 Subtract 7 inches.
For D2 Subtract 12 inches.

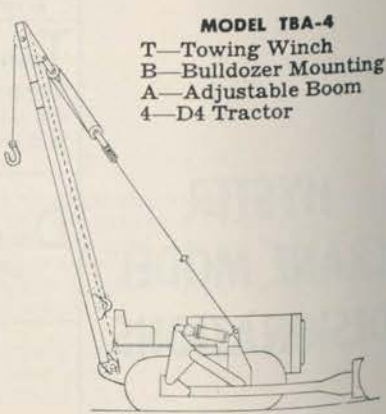
EXAMPLES OF VARIOUS MODEL DESIGNATIONS:



MODEL TBF-4
T—Towing Winch
B—Bulldozer Mounting
F—Fixed Boom
4—D4 Tractor

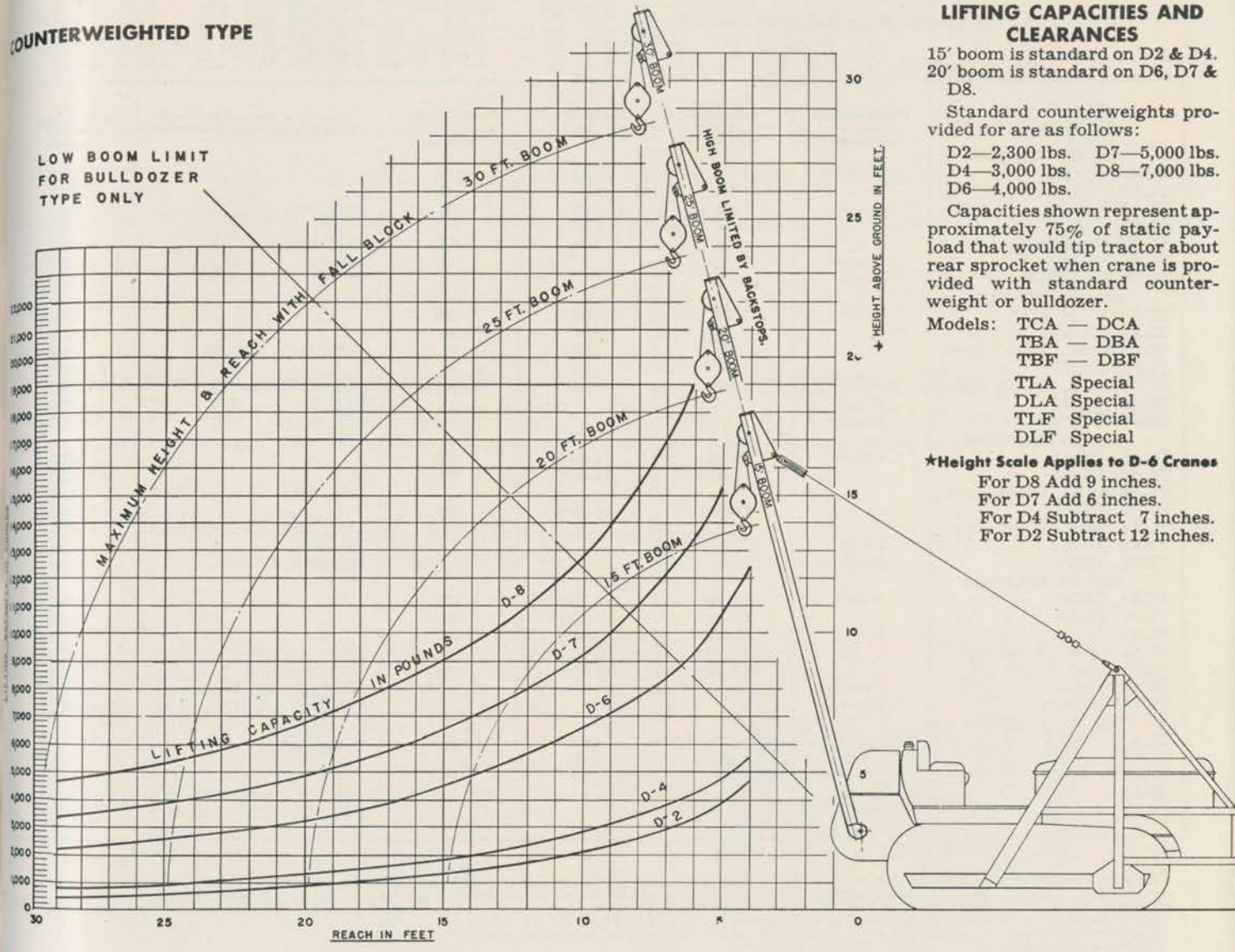


MODEL TLF-4
T—Towing Winch
L—Low Backstay
F—Fixed Boom
4—D4 Tractor



MODEL TBA-4
T—Towing Winch
B—Bulldozer Mounting
A—Adjustable Boom
4—D4 Tractor

COUNTERWEIGHTED TYPE



LIFTING CAPACITIES AND CLEARANCES

15′ boom is standard on D2 & D4.
20′ boom is standard on D6, D7 & D8.

Standard counterweights provided for are as follows:

D2—2,300 lbs. D7—5,000 lbs.
D4—3,000 lbs. D8—7,000 lbs.
D6—4,000 lbs.

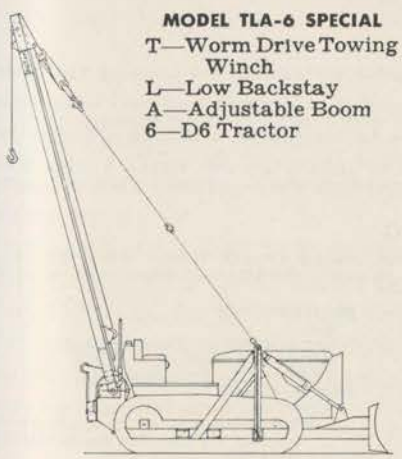
Capacities shown represent approximately 75% of static payload that would tip tractor about rear sprocket when crane is provided with standard counterweight or bulldozer.

Models: TCA — DCA
TBA — DBA
TBF — DBF
TLA Special
DLA Special
TLF Special
DLF Special

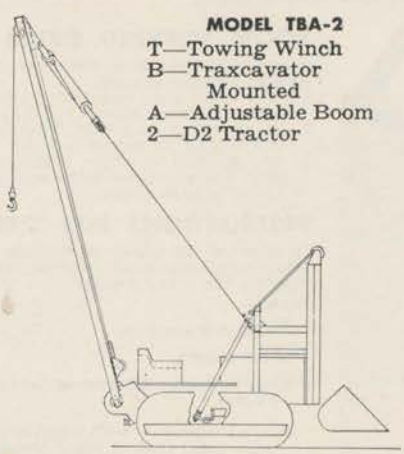
★Height Scale Applies to D-6 Cranes
For D8 Add 9 inches.
For D7 Add 6 inches.
For D4 Subtract 7 inches.
For D2 Subtract 12 inches.

EXAMPLES OF VARIOUS MODEL DESIGNATIONS:

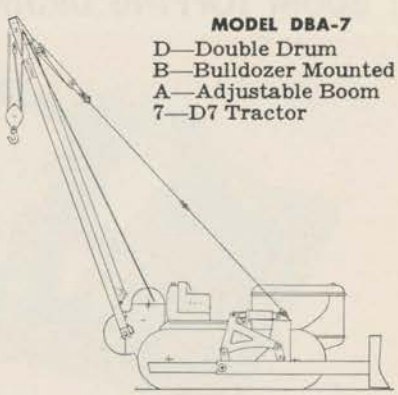
MODEL TLA-6 SPECIAL
T—Worm Drive Towing Winch
L—Low Backstay
A—Adjustable Boom
6—D6 Tractor



MODEL TBA-2
T—Towing Winch
B—Traxcavator Mounted
A—Adjustable Boom
2—D2 Tractor



MODEL DBA-7
D—Double Drum
B—Bulldozer Mounted
A—Adjustable Boom
7—D7 Tractor



HYSTER *Tractor Cranes*

SPECIFICATIONS FOR STANDARD CRANES

Standard Boom Lengths.....D8, D7 and D6 — 20′
D4 and D2 — 15′

Special Boom Lengths Available.....D8 — 25′, 30′, 40′, 50′, 60′
D7 and D6 — 25′, 30′, 40′, 50′
D4 and D2 — 20′, 25′, 30′

CRANE MODELS	*Counterweight Required in Pounds	Maximum Allowable Track Width in Inches	Overall Width in Inches	Minimum Overall Height, Boom Lowered, in Inches	Caterpillar and LaPlant-Choate Dozers, Traxcavator Installations	Net Weight, Pounds, Approx.
FOR D8 TRACTORS						
TCA8	7000*	24	113	132	.....	4000
TLA8	....	24	109	90	.....	2050
TLA8 Special	....	24	109	90	R85, B85, 8A, 8S	2050
TLF8	....	24	109	90	.....	1950
TLF8 Special	....	24	109	90	R85, B85, 8A, 8S	1950
TBA8	None	...	...	...	B8, R8	1850
TBF8	None	...	...	...	B8, R8	1750
FOR D7 TRACTORS						
TCA7**, DCA7**	5000*	20	106	126	.....	3200
TLA7, DLA7	....	20	106	81	.....	1500
TLA7 Spec., DLA7 Spec.	....	20	106	81	R75, B75, 7A, 7S	1500
TLF7, DLF7	....	20	106	81	.....	1400
TLF7 Spec., DLF7 Spec.	....	20	106	81	R75, B75, 7A, 7S	1400
TBA7, DBA7	None	...	...	...	B71, R71, T-7	1350
TBF7, DBF7	None	...	...	...	B71, R71, T-7	1250
FOR D6 TRACTORS						
TCA6, DCA6	4000*	18-20†	84-99†	108	.....	2400
TLA6, DLA6	....	18-20†	84-99†	72	.....	1325
TLA6 Spec., DLA6 Spec.	....	...	...	...	R61, B61, 6S, R63, B63	1325
TLF6, DLF6	....	18-20†	84-99†	72	.....	1225
TLF6 Spec., DLF6 Spec.	....	...	...	...	R61, B61, 6S, R63, B63	1225
TBA6, DBA6	None	...	...	...	B6, B6X	1225
TBF6, DBF6	None	...	...	...	B6, B6X	1150
FOR D4 TRACTORS						
TCA4, DCA4	3000*	13-16†	62-82†	102	.....	1650
TLF4, DLF4	....	13-16†	62-82†	61	.....	800
TLA4, DLA4	....	13-16†	62-82†	61	.....	900
TLA4 Spec, DLA4 Spec.	....	13-16†	62-82†	124	Improved T-4	900
TLF4 Spec, DLF4 Spec.	....	13-16†	62-82†	124	Improved T-4	800
TBA4, DBA4	None	...	...	...	4B, 4BX, 4R, 4RX, T-4	650
TBF4, DBF4	None	...	...	...	4B, 4BX, 4R, 4RX, T-4	475
FOR D2 TRACTORS						
TCA2†	2300*	16†	72†	88	.....	1500
TLA2†	....	16†	72†	58	.....	725
TLF2†	....	16†	72†	58	.....	650
TBA2	None	...	...	...	B21, R21, B23, R23, T-2	590
TBF2	None	...	...	...	B21, R21, B23, R23, T-2	475

Hyster Tractor Cranes may be installed with various types and combinations of allied and auxiliary equipment. Any combination not covered in the "Caterpillar Dozers and Allied Equipment" columns above should be referred to the factory for investigation before ordering.
Caterpillar Dozers with front cable control units can be installed with Hyster Crane models TLF, TLA, DLF and DLA. The new "Improved T-4 Traxcavator" can only be installed with Hyster Cranes TLF4, TLA4, DLF4, DLA4.
*Counterweights are not furnished with cranes and are not included in weights or prices.
†Wide gauge tractors only.
**D7 Caterpillar Group 8B1700 top starting crank required to avoid interference with counterweight boxes.

NOTE: If tracks are wider than maximum indicated, crane will be of special design and factory must be consulted before ordering.
Installation of cranes is impractical with the D8 Three Drum Yarder and the D2 Tractor Donkey.

Subject to improvements and changes in specifications without notice.

BOOM TOPPING DRUM

BOOM TOPPING DRUM

Three different arrangements are available for raising and lowering the booms of Hyster Tractor Cranes:

1. The hand crab illustrated above is supplied as standard equipment on all cranes of the adjustable boom type.
2. If specified in order, Tractor Cranes for installation with Hyster Double Drums are rigged for power topping.
3. If specified in order, Tractor Cranes for installation with Hyster Towing Winches that are equipped with auxiliary drum units, may be rigged for power topping by the auxiliary drum.

INSTRUCTIONS FOR ORDERING

In view of the many variations of Hyster Tractor Cranes, Hyster Form No. 351 containing the following information should be supplied with every crane order to properly identify the crane wanted:

CRANE—
Model designation.
Boom length.
Type backstay structures (see above chart).
Boom topping — with auxiliary drum, with hand crab or fixed boom.

TRACTOR—
Size.
Serial number, if not current.
Gauge and track shoe width.
Tractor attachments if any.

HYSTER WINCH—
Model and serial number, if not current.
When equipped with auxiliary drum specify its use, for boom topping or hoisting.

BULLDOZER OR SHOVEL—Make and model.

HYSTER CURRENT UNITS ON NON-CURRENT TRACTORS...

Most Hyster current units can be installed on non-current tractor models, as shown on specification sheets, although, in some cases, adapter assemblies such as illustrated and listed below must be used.

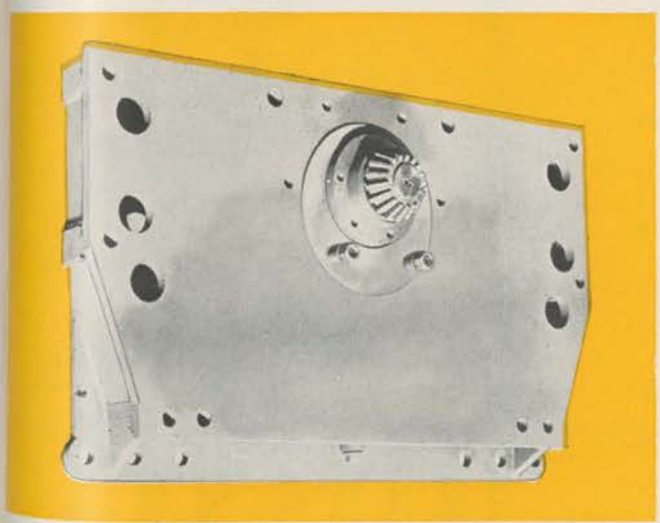
Adapter Assembly No. 1

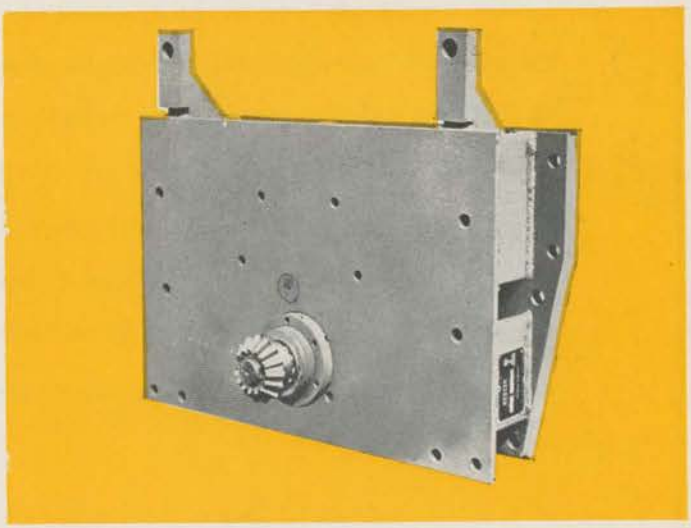
—to adapt Hyster D6N Towing Winch, D6N Tractor Donkey, and D6N Worm Drive Winch to the tractors listed below.

Adapter No. 2

—to adapt Hyster D4 Towing Winch and D4 Tractor Donkey to the tractors listed below.

The adapter assembly, which is a gear transmission, adapts the non-current tractor engine speed so that current Hyster winches can be used.





"CATERPILLAR" TRACK-TYPE TRACTORS

RD7 serial 9G1 and up, 5E 7501 and up.
Fifty serial 1E1 and up, 5A1 and up.
Assembly No. 1:
Part 41807-A for D6N Towing Winch.
Part 41807AB for D6N Tractor Donkey.
Part 41807-AC for D6N Worm Drive Winch.
Approximate shipping weight 680 pounds.
Approximate net weight 630 pounds.

"CATERPILLAR" TRACK-TYPE TRACTORS

D6 serial 2H1 and up, 5E 8501 and up.
Forty serial 3G1 and up, 5G1 and up.
Thirty-five serial, 6E1 and up, 5C1 and up.

Assembly No. 2:
Part 41844-A for D4 Towing Winch.
Part 41891-A for D4 Tractor Donkey.
Approximate shipping weight 485 pounds.
Approximate net weight 435 pounds.

SOLD BY "CATERPILLAR" DISTRIBUTORS and Export Dealers throughout the world . . .

Your assurance of Hyster supremacy in quality and workmanship are the words—"sold and serviced by 'Caterpillar' dealers everywhere". Your "Caterpillar" dealer's facilities are complete. They include an experienced sales organization to give dependable information and expert advice on all tractor and equipment problems. A factory trained staff of mechanics keeps equipment in good mechanical condition. Hyster is proud of its association with this world-wide sales and service organization.

HYSTER COMPANY • **Portland 8, Oregon** • **Peoria 1, Illinois**

HELD & McCOY MACHINERY CO.

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Denver 17, Colorado

42 N. WASHINGTON ST.
Monte Vista, Col.

518 N. 3RD STREET
Sterling, Col.

Form 1017B—5,000—1047S

Printed in U. S. A.

ONE TAbor 2375

McCOY COMPANY

Caterpillar

3201 BRIGHTON BLVD. P O. BOX 5544 UNION TERMINAL STATION

DENVER 17, COLORADO

February 25, 1949

Mr. Lawrence V. Monninger
Forestry Building
Colorado A & M College
Fort Collins, Colorado

Dear Sir:

Thank you for your letter of February 22. We are pleased to quote the following prices on "Caterpillar" Model D6 tractors, available in two gauges - 74" and 60", measured from center-to-center of the tracks. The D6-74" is quoted at $7545.00 and the D6-60" at $7370.00. Both prices are for tractor with Hyster D6N Donkey arrangement.

The following equipment is quoted for your information and is applicable to either gauge tractor:

Heavy duty track roller guards	$ 104.00
Logging guard for use with front bumper	61.00
Logging guard for use without front bumper	70.00
Lighting system including battery, switch, dash light, 115W generator and two white lights . .	153.00
Starting system for gasoline starting engine . . .	85.00

The Model D2 "Caterpillar" tractor is also available in two gauges and is priced at $3560.00 for the 50" gauge and $3495.00 for the 40" gauge, with suitable attachments as follows:

Heavy duty track roller guards	$ 74.00
Belt pulley drive, with pulley	169.00
Lighting system including battery, switch, dash light, 115W generator with two lights . .	162.00
Starting system for gasoline starting engine . .	76.00

The Hyster Model D6N Tractor Donkey for use on the D6 tractor is priced at $3190.00. As you will see on the enclosed specification sheet, this winch does not have the capacity which you specify. We believe you would be much better satisfied with a D7 tractor and D7L tractor Donkey which by nature of their heavier construction and greater capacities, are more suited for logging operations. For your information, prices on this equipment is quoted herewith:

Mr. Lawrence V. Monninger February 25, 1949

One "Caterpillar" D7 tractor for use with Hyster Model D7L Donkey	$10010.00
Logging guard for use with front bumper . .	83.00
Logging guard for use without front bumper .	95.00
Lighting system, same as described for D6 .	158.00
Starting system " " " " " .	81.00
Model D7L Hyster Tractor Donkey	5044.00

Enclosed are specification sheets for the various pieces of equipment and a booklet published by the Skagit Steel & Iron Works which has general specifications on their logging hoists, plus some illustrations and descriptions of different types of logging riggings which we hope will be of assistance in planning your operation.

All of the prices quoted in this letter are current, f.o.b. Denver, Colorado. The prevailing price at time of delivery shall apply.

Thank you for the opportunity of quoting and if we may be of any further help to you please let us know.

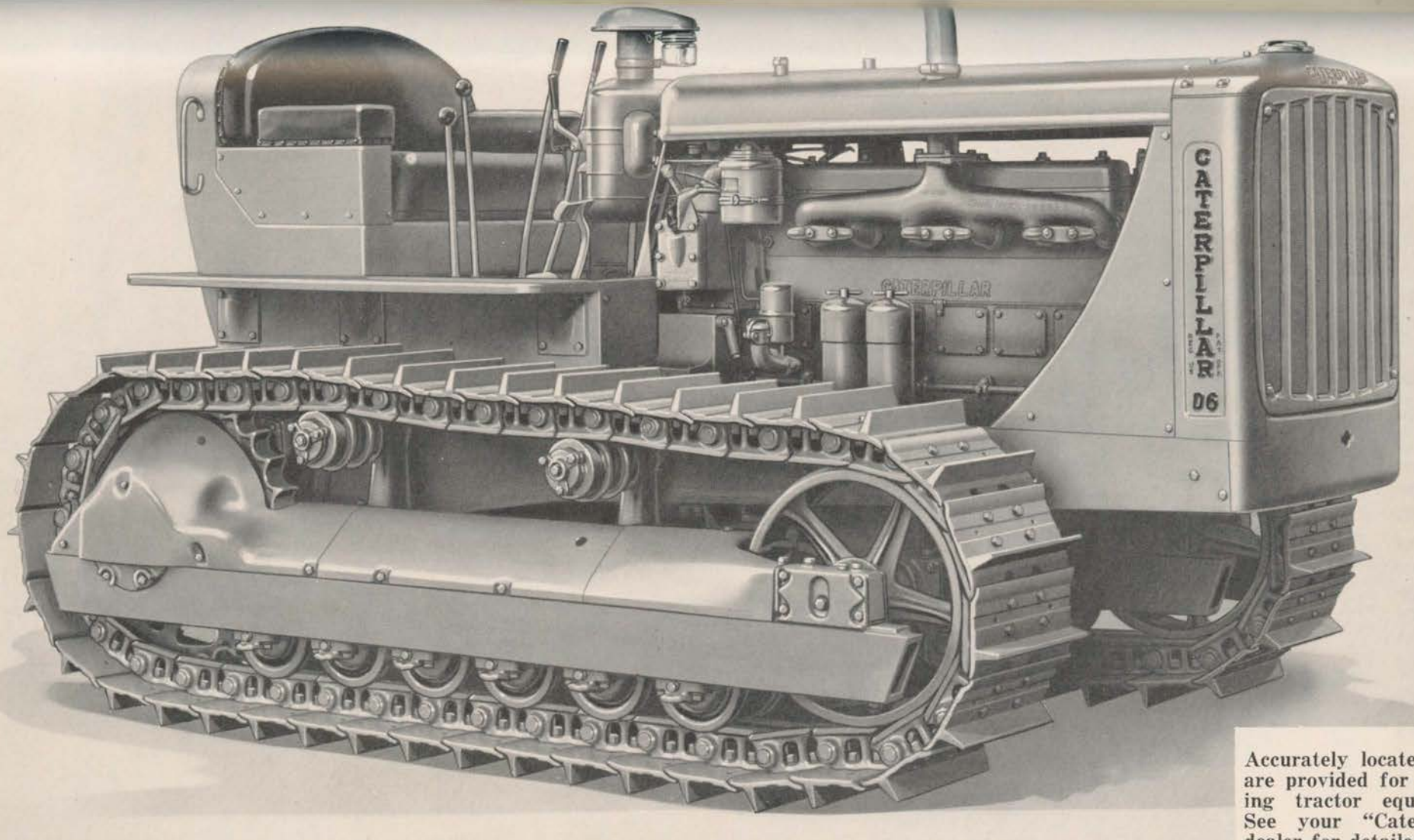
Yours very truly,

McCOY COMPANY

R. R. Orr

R. R. Orr
Sales Department

RRO:r
cc:EW
Enc.



Accurately located holes are provided for attaching tractor equipment. See your "Caterpillar" dealer for detailed information.

"Caterpillar" Diesel D6 Tractor

(SPECIFICATIONS ON OTHER SIDE)

Specifications of "Caterpillar" Diesel D6 Tractor

CAPACITY:	Standard	Optional
The following are maximum horsepowers at sea level, as established by manufacturer's tests:		
Drawbar horsepower	65	65
Belt horsepower	75	75
The following are rated speed drawbar pulls observed during tests made by the manufacturer:		
Drawbar pull (Lb.):		
First	15,500	13,600
Second	10,750	9,800
Third	7,320	7,860
Fourth	4,730	5,790
Fifth	3,130	3,600
The following calculated values for maximum torque drawbar pull are based on the observed drawbar pull shown above. When slowed down by overload, "Caterpillar" Engines develop a considerably greater turning effort (torque) at the flywheel, which results in greater drawbar pull at reduced travel speed:		
Drawbar pull (Lb.):		
First	16,350	15,100
Second	11,950	10,850
Third	8,130	8,750
Fourth	5,250	6,310
Fifth	3,490	4,000
Travel speeds at rated engine speed:	M.P.H. F.P.M.	M.P.H. F.P.M.
Forward—		
First	1.4 - 123	1.7 - 150
Second	2.3 - 202	2.5 - 220
Third	3.2 - 282	3.0 - 264
Fourth	4.4 - 387	3.7 - 326
Fifth	5.8 - 510	5.3 - 466
Reverse—		
First	1.8 - 158	2.1 - 185
Second	2.8 - 246	3.0 - 264
Third	3.9 - 343	3.6 - 317
Fourth	5.4 - 475	4.6 - 405

Engine—four-cycle, water cooled:	
Fuel	Commercial Diesel Fuel
Number of cylinders	6
Bore and stroke	4½"x5½"
Piston displacement	525 Cu. In.
R.P.M.—governed at full load	1,400
Piston speed at 1,400 R.P.M.	1,283 F.P.M.
R.P.M. at maximum torque speed	900
N.A.C.C. horsepower rating for U.S.A. tax purposes	48.7
Lubrication	Full Pressure
Crankshaft, number and diameter of main bearings	7 — 3½"
Area of main bearing surface, total	138 Sq. In.

Starting Method:
Independent 2-cylinder, 4-cycle, horizontal gasoline engine, equipped with high tension magneto and impulse coupling, down draft carburetor and flyball governor. Bore 3⅛". Stroke 3½". 15 H.P. @ 3,000 R.P.M. Drive by multiple disc clutch and helical gears to flywheel.

Length of tracks on ground (center of drive sprocket to center of front idler)	85⅝"
Area of ground contact, with 16" grouser track shoes	2,740 Sq. In.
Overall Dimensions:	
Length	12'-5$\frac{3}{16}$"
Height (Height measured from tip of grouser of standard track shoe to highest point, exclusive of exhaust pipe and precleaner.)	6'-3¼"
Ground Clearance (measured from lower face of standard track shoe).	12½"
Height Drawbar (measured from lower face of standard track shoe to center of clevis)	14"
Lateral Movement of Drawbar (measured at drawbar pin)	27¾"
Track:	
Width of standard track shoe	16"
Height of grouser (measured from upper face of standard track shoe)	2⅛"
Diameter of track shoe bolts	$\frac{7}{8}$"
Diameter of track pins	1$\frac{7}{16}$"
Diameter of track pin bushings	2⅛"
***Steering:**	
Clutch friction material	Metallic
Number of friction surfaces, each clutch	24
Type of clutch release	Hydraulic
Brakes, dry	Contracting Band
Transmission:	
Power transmitted through flexible coupling and over center engagement, dry flywheel clutch with metallic friction surfaces. Selective type change speed gear set. Carburized gears.	
Capacities:	U. S. Gallons
Cooling system	12¼
Crankcase, lubricating oil	4¾
Steering clutch hydraulic control unit	1¼
Transmission, lubricating oil	9
Final drive, lubricating oil, each	2¾
Fuel tank	48

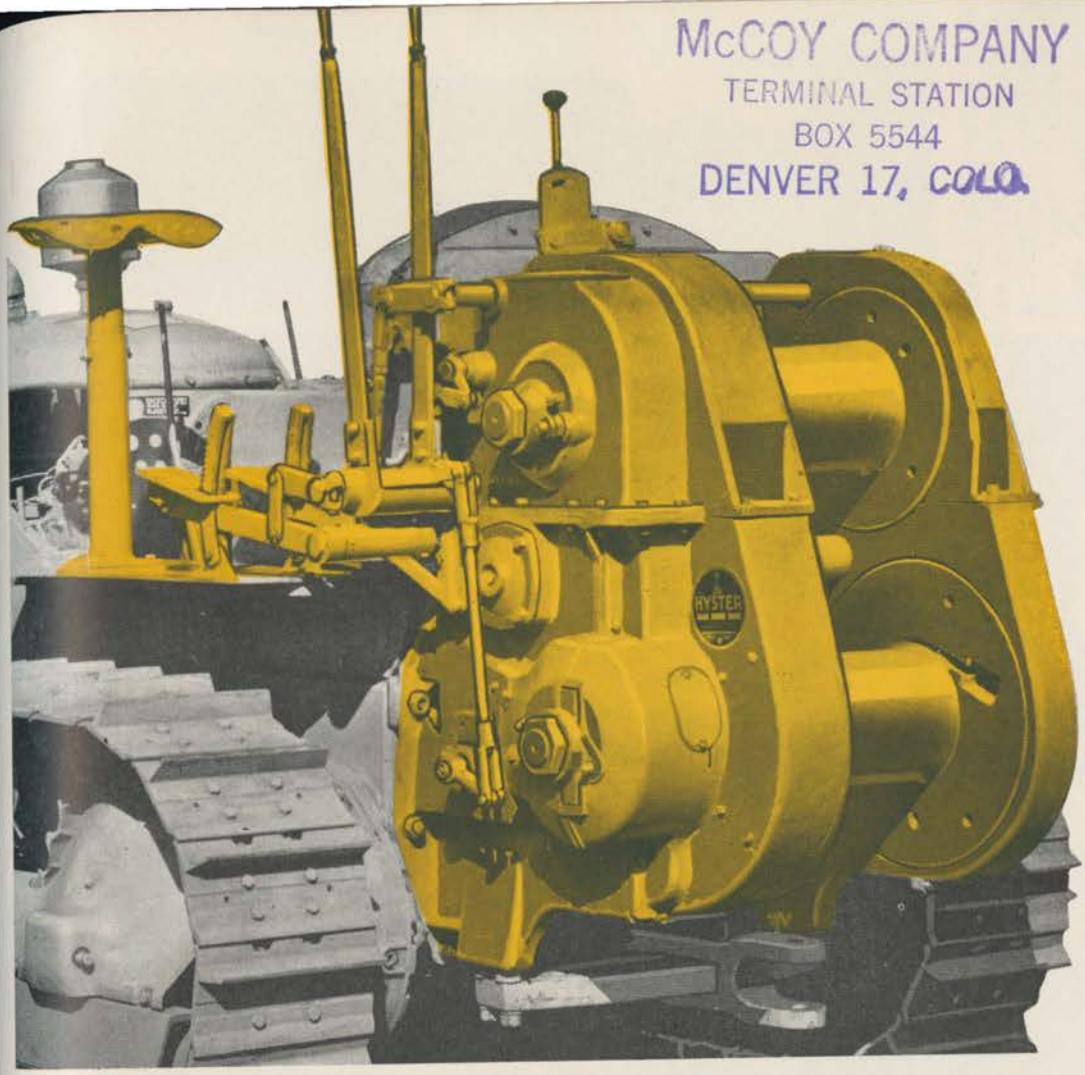
	74" Gauge	60" Gauge
Overall Width	7'-10½"	6'-8½"
Weight, shipping (approx.), Lb.	17,215	16,725

* Each track controlled by slow-speed, heavy-duty, dry multiple disc clutch and contracting band brake.

CATERPILLAR TRACTOR CO. PEORIA, ILLINOIS
DIESEL ENGINES—TRACTORS—MOTOR GRADERS—EARTHMOVING EQUIPMENT

FORM 1823-51-O
PRINTED IN U.S.A.

HYSTER D6N TRACTOR DONKEY



HYSTER
THE ANY LIFT OR PULL

FOR "CATERPILLAR" D6 DIESEL TRACTOR

MOBILE DOUBLE DRUMS

Hyster D6N Tractor Donkey is for use on "Caterpillar" D6 Diesel Tractors starting with serial numbers 8U1, 9U1, 4R1, 5R1.

Mounted on a "Caterpillar" track-type Tractor, the Hyster Tractor Donkey provides a MOBILE hoist unit that moves under its own power over any ground surface. Designed for yarding, loading logs and for general hoisting service. Features include:

FULL TRACTOR MOBILITY for fast moves.

TWO SPEEDS on both friction driven drums.

FREE SPOOLING DRUMS mounted on anti-friction roller bearings.

EASY OPERATION. Pin-toggle friction control on both drums.

DRUM BRAKES. Enclosed contracting type.

Gypsy spool available as additional extra item.

Single drum model available.

SPECIFICATIONS

Hyster Model — **D6N TRACTOR DONKEY**

	Main Drum	Upper Drum
Drum size:		
Barrel diameter	10″	10″
Flange diameter	23½″	19″
Barrel length	18″	18″
Cable capacity:	700 ft. ⅞″	1,240 ft. ½″ or
Maximum line, evenly spooled	or 860 ft. ¾″	1,600 ft. $\frac{7}{16}$″
Capacity factor "F"	2035	1175
Available Line Pulls:		
Low gear, bare drum	25,000 lbs.	9,200 lbs.
Low gear, full drum	12,500 lbs.	5,000 lbs.
High gear, bare drum	14,000 lbs.	4,600 lbs.
High gear, full drum	7,200 lbs.	2,500 lbs.
Line Speeds:		
Low gear, bare drum	95 f.p.m.	270 f.p.m.
Low gear, full drum	200 f.p.m.	495 f.p.m.
High gear, bare drum	185 f.p.m.	520 f.p.m.
High gear, full drum	385 f.p.m.	970 f.p.m.

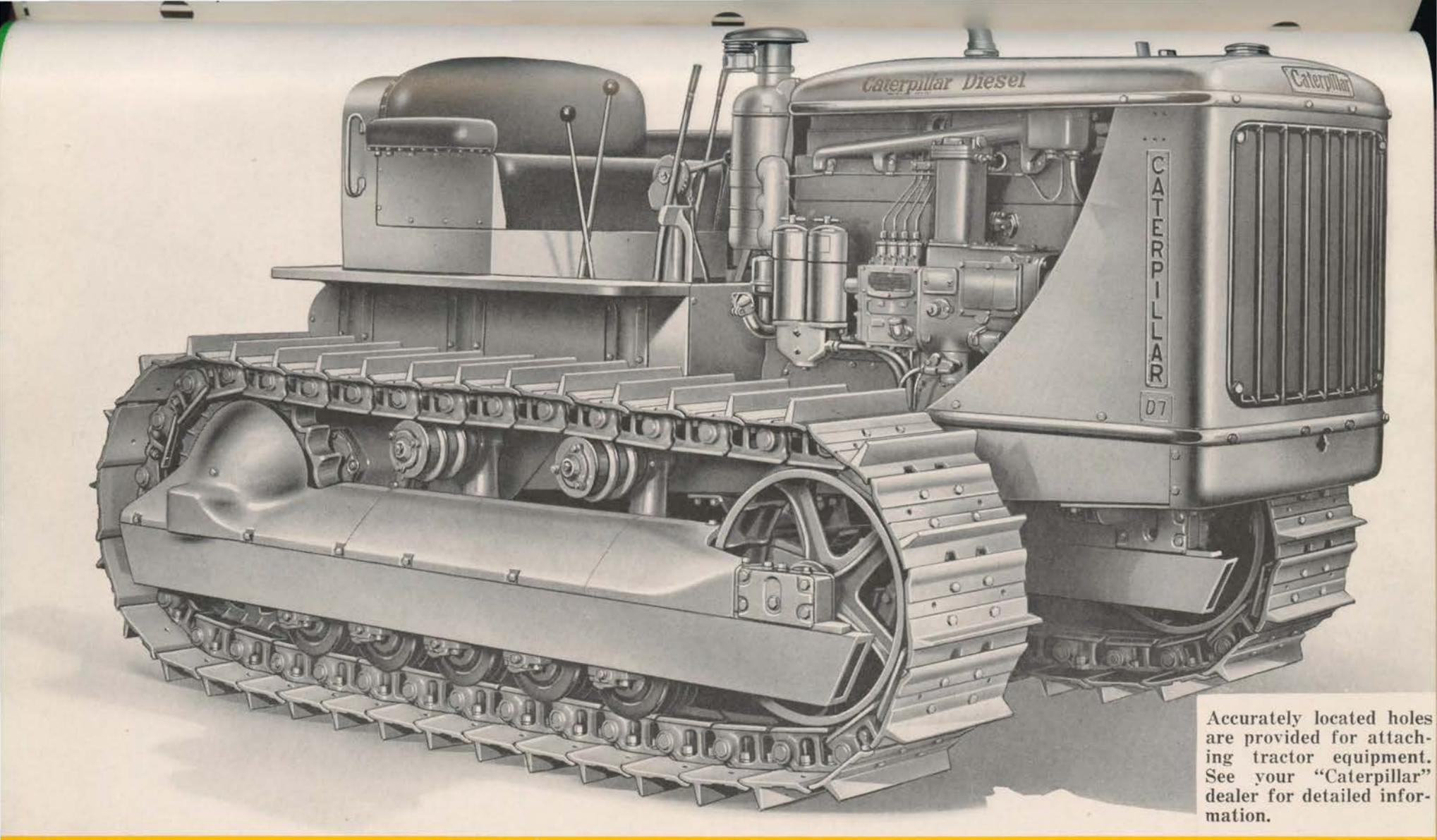
Net weight, approximately ..... 3,365 lbs.
Domestic shipping weight, approximately ..... 3,515 lbs.
Code word ..... SXDDD

Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

Form 1031B—2M—1047S

Printed in U. S. A.



Accurately located holes are provided for attaching tractor equipment. See your "Caterpillar" dealer for detailed information.

"Caterpillar" Diesel D7 Tractor

(SPECIFICATIONS ON OTHER SIDE)

Specifications of "Caterpillar" Diesel D7 Tractor

CAPACITY:	Standard	Optional
The following are maximum horsepowers at sea level, and are taken from Nebraska Tractor Test No. 358:		
Drawbar horsepower	80.44	80.44
Belt horsepower	92.84	92.84
The following are the observed drawbar pull, as reported in Nebraska Tractor Test No. 358:		
Drawbar pull (Lb.):		
First	21,351	21,351
Second	13,454	12,300
Third	9,090	10,100
Fourth	5,994	8,400
Fifth	4,550	5,900
The following calculated values for maximum torque drawbar pull are based on the observed drawbar pull shown above. When slowed down by overload, "Caterpillar" Engines develop a considerably greater turning effort (torque) at the flywheel, which results in greater drawbar pull at reduced travel speed:		
Drawbar pull (Lb.):		
First	22,750	22,750
Second	14,350	13,125
Third	9,700	10,775
Fourth	6,400	8,950
Fifth	4,850	6,300
Travel speed at rated engine speed:	M.P.H. F.P.M	M.P.H. F.P.M.
Forward—		
First	1.4 - 123	1.4 - 123
Second	2.2 - 194	2.4 - 211
Third	3.2 - 282	2.9 - 255
Fourth	4.6 - 405	3.5 - 308
Fifth	6.0 - 528	5.0 - 440
Reverse—		
First	1.6 - 141	1.6 - 141
Second	2.6 - 229	2.9 - 255
Third	3.8 - 334	3.5 - 308
Fourth	5.4 - 475	4.1 - 361
Engine—four-cycle, water cooled:	Commercial Diesel Fuels	
Fuel	4	
Number of cylinders	5¾"x8"	
Bore and stroke	831 Cu. In.	
Piston displacement	1,000	
R.P.M. — governed at full load	1,333 F.P.M.	
Piston speed at 1,000 R.P.M.		
R. P. M. at maximum drawbar pull (point of maximum torque)	750	
N. A. C. C. horsepower rating for U. S. A. tax purposes	52.90	
Lubrication	Full Pressure	
Crankshaft:		
Number of main bearings	5	
Diameter of main bearings	3¾"	
Total area of main bearing surface	167 Sq. In.	

Starting Method: Independent 2-cylinder, 4-cycle, vertical gasoline engine, equipped with 2-speed transmission, high tension magneto and impulse coupling, down draft carburetor and flyball governor. Bore 3⅝". Stroke 4". 24 H.P. @ 2,700 R.P.M. Drive by single plate clutch and helical gears to flywheel.	
Gauge, center to center of tracks	74"
Length of tracks on ground (center of drive sprocket to center of front idler)	93¼"
Area of ground contact, with 20" grouser track shoes	3,730 Sq. In.
Overall dimensions:	
Length	13'-6¼"
Width	8'-1"
Height (Height measured from tip of grouser of standard track shoe to highest point, exclusive of exhaust pipe and precleaner.)	6'-8"
Ground clearance (measured from lower face of standard track shoe.)	15½"
Height drawbar (measured from lower face of standard track shoe to center of clevis.)	17¼"
Lateral movement of drawbar (measured at drawbar pin.)	36"
Track:	
Width of standard track shoe	20"
Height of grouser (measured from upper face of standard track shoe)	2⅜"
Diameter of track shoe bolts	⅝"
Diameter of track pins	1¾"
Diameter of track pin bushings	2⅝"
Steering:†	
Clutch friction material	Metallic
Number of friction surfaces, each clutch	20
Type of clutch release	Hydraulic
Brakes, dry	Contracting Band
Transmission: Power transmitted through flexible coupling and over center engagement, dry flywheel clutch with metallic friction surfaces. Selective type change speed gear set. Carburized gears.	
Capacities:	U.S. Gallons
Cooling system	18
Crankcase, lubricating oil	5½
Steering clutch hydraulic control unit	1¼
Transmission, lubricating oil	10
Final drive, lubricating oil, each	5½
Fuel tank	65
Weight, Shipping (approximate)	24,630 Lb.

†Each track controlled by slow speed, heavy duty, dry multiple disc clutch and contracting band brake.

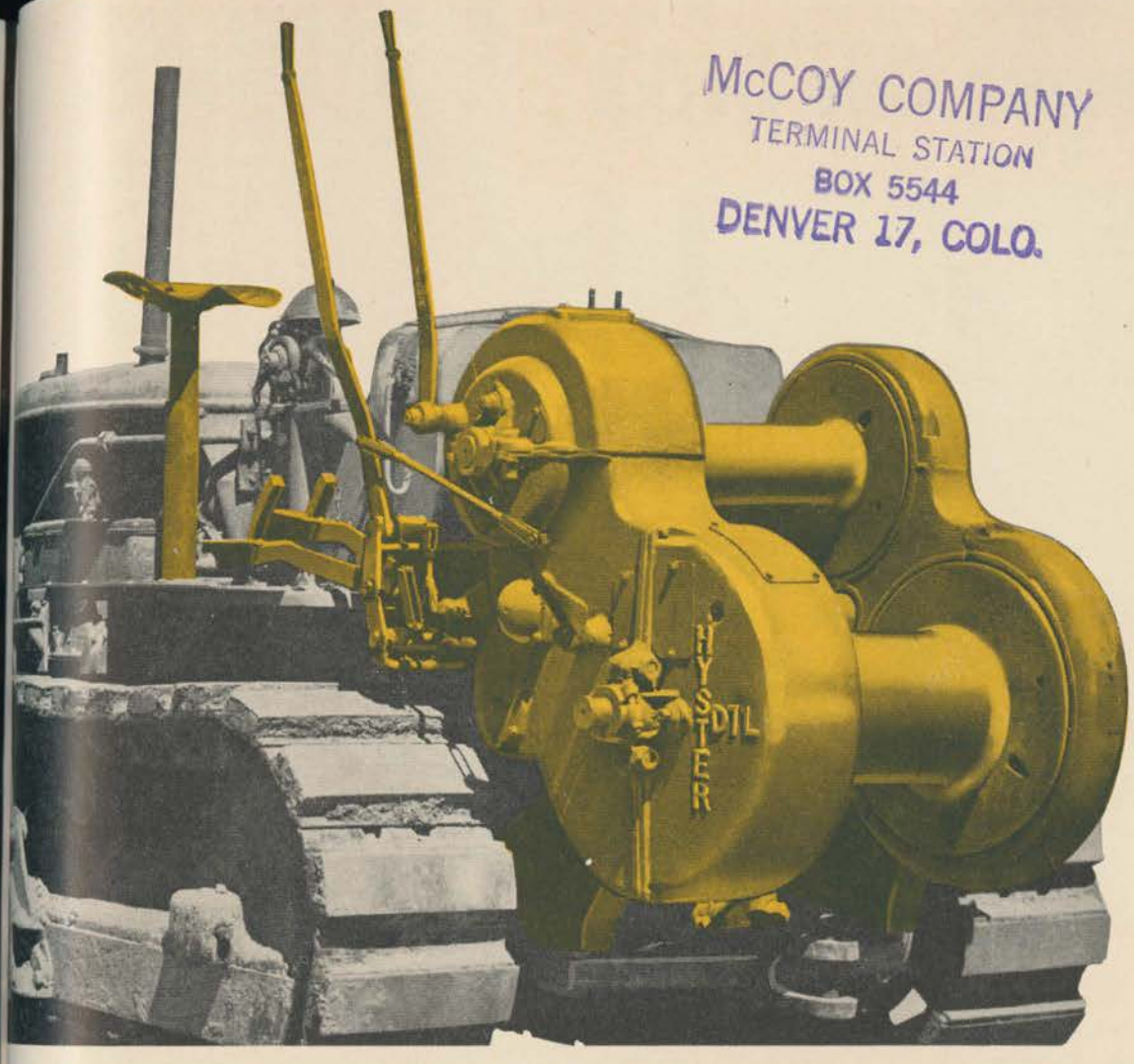
CATERPILLAR TRACTOR CO. PEORIA, ILLINOIS

DIESEL ENGINES—TRACTORS—MOTOR GRADERS—EARTHMOVING EQUIPMENT

FORM 1823—52-Q

PRINTED IN U.S.A.

HYSTER D7L TRACTOR DONKEY



HYSTER
FOR ANY LIFT OR PULL

FOR "CATERPILLAR" D7 DIESEL TRACTOR

MOBILE LOGGING DRUMS

For use on "Caterpillar" D7 Diesel Tractors starting with serial number 7MI. Gives outstanding performance in highlead logging, loading and general hoisting service. Features include:

FULL TRACTOR MOBILITY for fast moves.

TWO SPEEDS on all drums.

DRUMS—Standard unit has two drums. Special units may be equipped with a straw line drum or a gypsy spool, but not both.

EASY OPERATION—Pin-toggle friction control on main and haulback clutches.

OVERWINDING—All drums overwind.

DRUM BRAKES—Enclosed contracting band type.

FREE SPOOLING DRUMS mounted on anti-friction roller bearings.

SPECIFICATIONS

Hyster Model — D7L TRACTOR DONKEY

Drum Size:	Main	Haulback	Strawdrum
Barrel diameter	10″	8″	6½″
Flange diameter	26″	20″	22″
Barrel length	24⅞″	24⅞″	10″
Cable capacity	960 ft. 1″	2360 ft. 7/16″	2940 ft. 5/16″
Capacity factor "F"	3581	2089	1104
Line Pulls:			
Low gear, bare drum	29,068 lbs.	10,300 lbs.	13,020 lbs.
full drum	12,776 lbs.	4,580 lbs.	4,080 lbs.
High gear, bare drum	16,780 lbs.	5,941 lbs.	7,509 lbs.
full drum	7,370 lbs.	2,642 lbs.	2,353 lbs.
Line Speeds:			
Low gear, bare drum	105.4 fpm	297.4 fpm	235.0 fpm
full drum	239.8 fpm	668.9 fpm	750.9 fpm
High gear, bare drum	182.8 fpm	515.7 fpm	408.0 fpm
full drum	415.7 fpm	1159.7 fpm	1301.9 fpm

	Double Drum	Three Drum
Net weight including transmission and controls but without cable	4,300 lbs.	4,700 lbs.
Domestic shipping weight, approx.	4,400 lbs.	4,800 lbs.
Code word	SLDKY	SLTDM

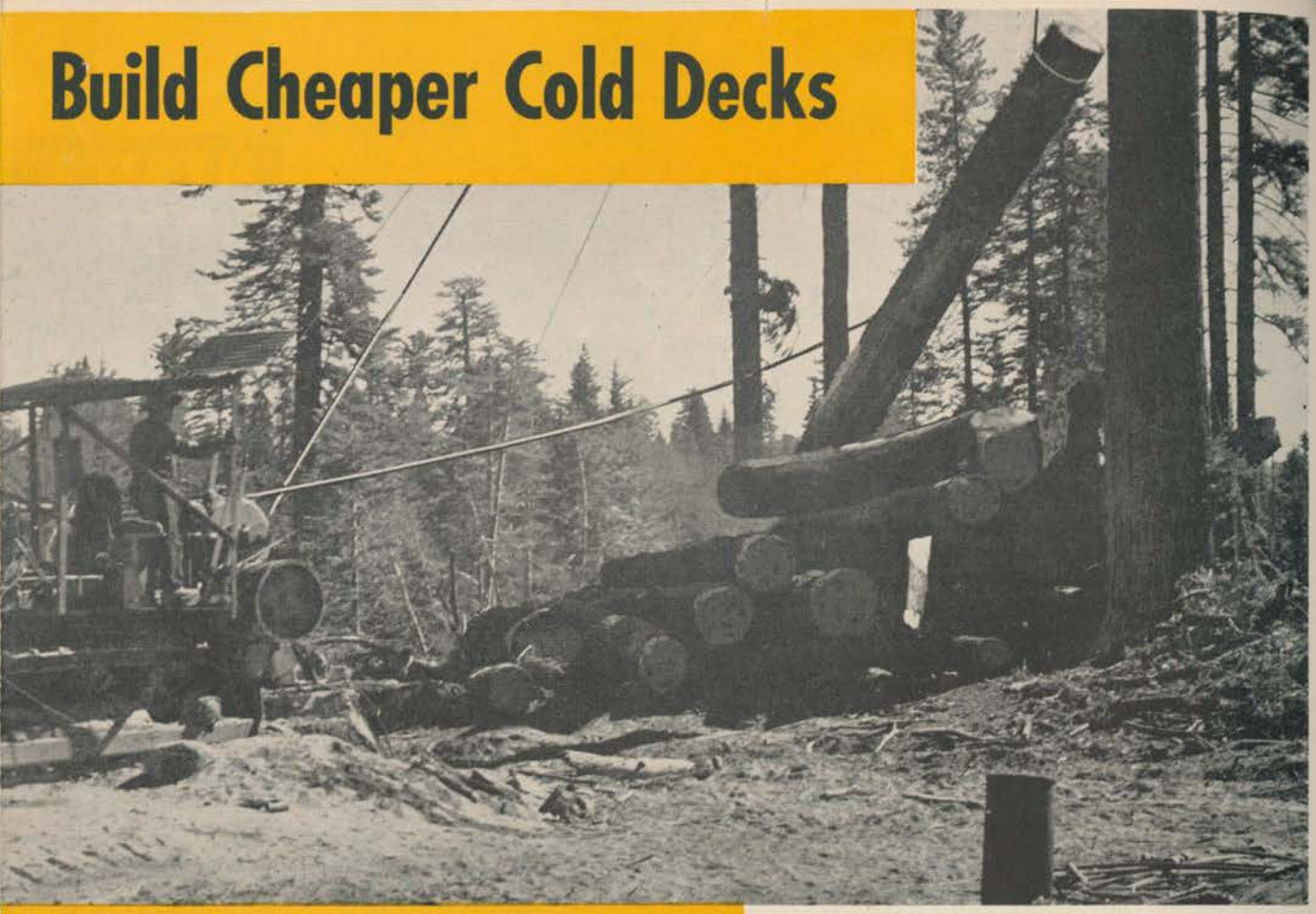
Subject to improvements and changes in specifications without notice. Specify serial number of tractor on which equipment is to be installed.

PORTLAND, OREGON **HYSTER COMPANY** PEORIA, ILLINOIS

FORM 1032B—2M—1047S

Printed in U. S. A.

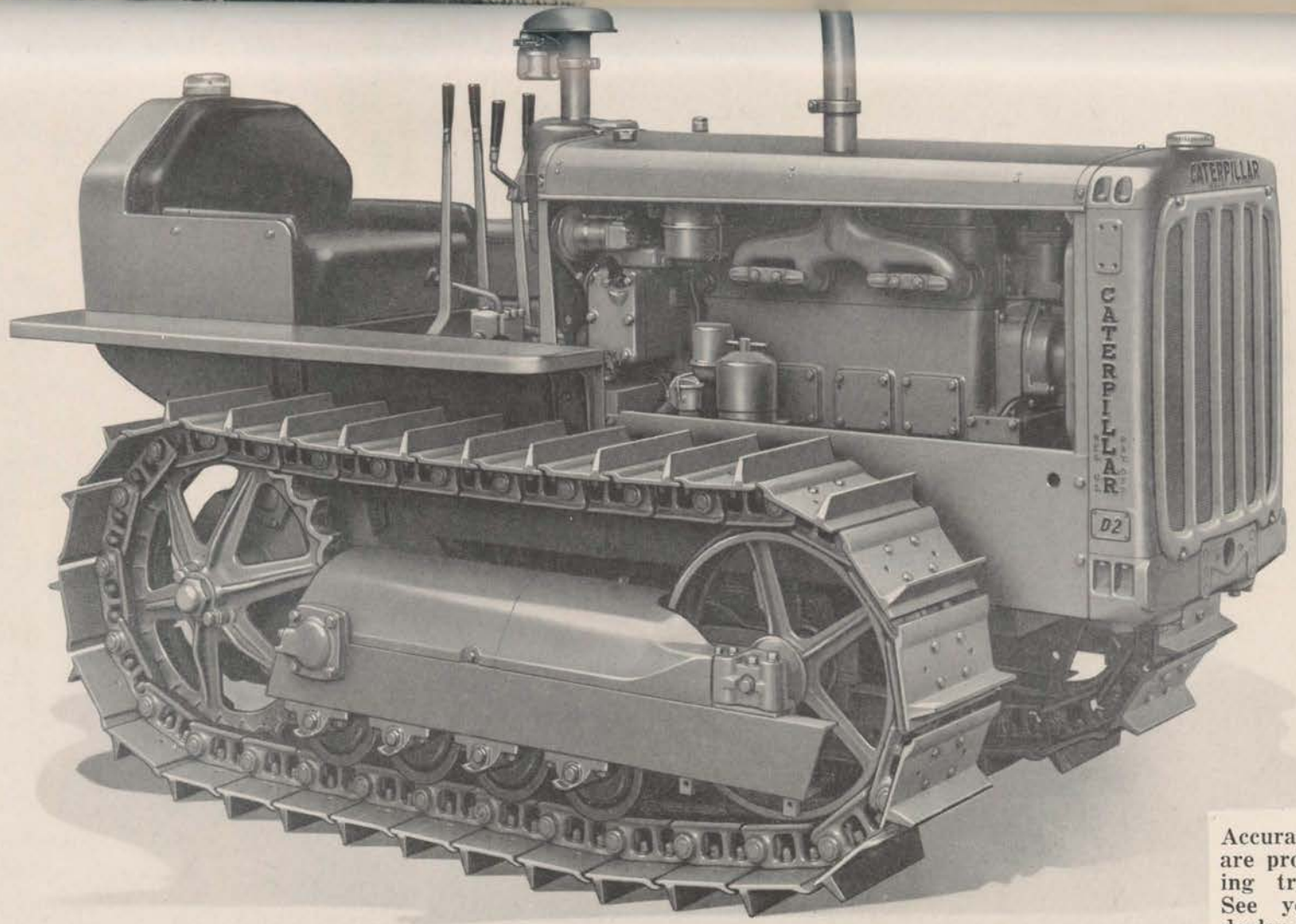
Build Cheaper Cold Decks



Cold decks are built quickly with Hyster Tractor Yarders. They are quick movers from finished deck to the next spar tree. Less moving time means more production and lighter rigging requires fewer men.

Yarding to a loader with a Hyster D8 Tractor Yarder in a spruce and hemlock operation.

Yarding Douglas fir logs to a cold deck with Hyster D7L Tractor Donkey. Average daily production is 75,000 bd. ft. The timber is heavy, averaging about 14 lbs. per bd. ft., and some of the logs exceed 3000 bd. ft.



Accurately located holes are provided for attaching tractor equipment. See your "Caterpillar" dealer for detailed information.

"Caterpillar" Diesel D2 Tractor

(SPECIFICATIONS ON OTHER SIDE)

Specifications of "Caterpillar" Diesel D2 Tractor

CAPACITY:	
The following are maximum horsepowers at sea level, as established by manufacturers' tests:	
Drawbar horsepower	32
Belt horsepower	38
The following are rated speed drawbar pulls, observed during manufacturers tests:	
Drawbar pull:	
First	6,250
Second	4,700
Third	3,800
Fourth	3,070
Fifth	1,960
The following calculated values for maximum drawbar pull are based on the observed drawbar pull shown above. When slowed down by overload "Caterpillar" engines develop a considerably greater turning effort at the flywheel (torque), which results in greater drawbar pull at reduced travel speed:	
Drawbar pull Maximum:	
First	6,680
Second	5,470
Third	4,420
Fourth	3,570
Fifth	2,280
Speeds in M.P.H. at full load governed engine R.P.M.	
First (150 ft./min.)	1.7
Second (220 ft./min.)	2.5
Third (264 ft./min.)	3.0
Fourth (317 ft./min.)	3.6
Fifth (449 ft./min.)	5.1
Reverse (185 ft./min.)	2.1
Engine—four-cycle, water-cooled:	
Fuel	Commercial Diesel Fuels
Number of Cylinders	4
Bore and stroke	4"x5"
Piston displacement	252 Cu. In.
R. P. M.—governed at full load	1,525
Piston speed	1,271 F.P.M.
R. P. M. at maximum drawbar pull (point of maximum torque)	1,000
N. A. C. C. horsepower rating for tax purposes	25.6
Lubrication	Force Feed
Crankshaft:	
Number of main bearings	5
Diameter of main bearings	2¾"
Total area main bearing surface	87.9 Sq In.
Starting Method:	
Independent, two cylinder, horizontal opposed, 4-cycle gasoline engine, equipped with high tension magneto, down-draft carburetor and flyball governor. Bore 2¾". Stroke 3". 10 H. P. at 3,000 R. P. M. Drive by multiple disc clutch and helical gears to flywheel.	

Length of tracks on ground (center drive sprocket to center front idler)	4'-6½"
Area ground contact (with 12" track shoes)	1,308 Sq. In.
Over-all:	
Length	8'-11⅝"
Height (measured from tip of grouser of standard track shoe to highest point, exclusive of exhaust pipe and air cleaner inlet screen)	4'-9⅜"
Ground Clearance (measured from lower face of standard track shoe)	9"
Height drawbar above ground (measured from lower face of standard track shoe)	12"
Lateral movement drawbar (measured at pin)	20"
Track:	
Width of standard track shoe	12"
Height of grouser (measured from upper face of standard track shoe)	1⅞"
Diameter of track shoe bolts	7/16"
Diameter of track pins	1⅛"
Diameter of track pin bushings	1 11/16"
Steering	†
Number friction surfaces in each steering clutch	16
Transmission	‡
Capacities:	
Cooling system in U. S. Standard gallons	7¾
Lubricating system:	
Crankcase, in quarts	15
Transmission case, in quarts	8
Final drive case (each), in quarts	4
Fuel tank, in U. S. Standard gallons	20

	50" Gauge	40" Gauge
Over-all width	5'-5¾"	4'-7¾"
Weight, shipping (approx.)	6,870 lbs.	6,710 lbs.

†Each track controlled by slow speed, heavy duty, dry multiple disc clutch and contracting band brake.

‡Power transmitted through dry type flywheel clutch to selective type change speed gear set.

CATERPILLAR TRACTOR CO. PEORIA, ILLINOIS

DIESEL ENGINES—TRACTORS—MOTOR GRADERS—EARTHMOVING EQUIPMENT

FORM 1823—90-J PRINTED IN U.S.A.

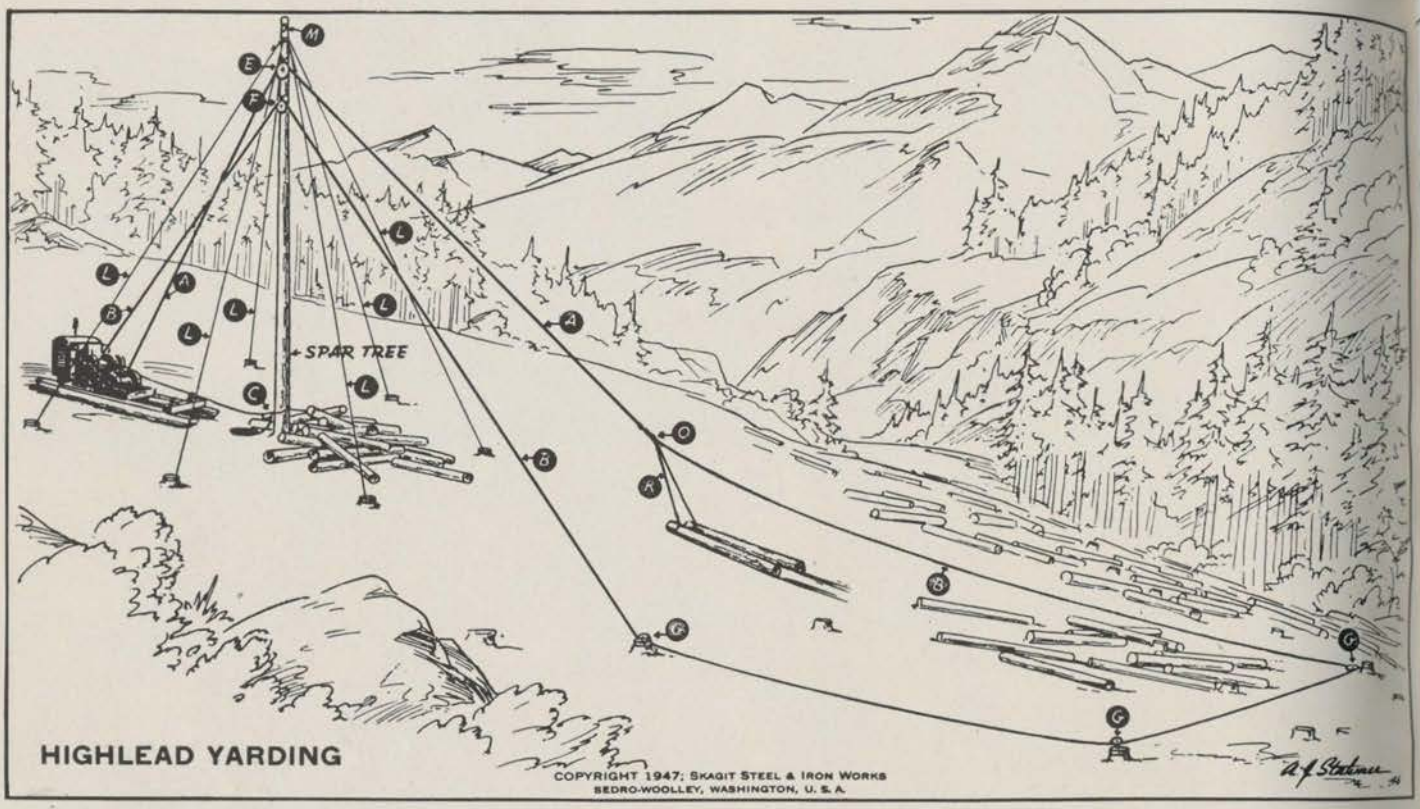
Skagit Logging Hoists

SKAGIT STEEL & IRON WORKS HAS SERVED THE LOGGER FOR NEARLY 50 YEARS. ITS LEADERSHIP IN THE DESIGN AND MANUFACTURE OF GASOLINE AND DIESEL YARDERS AND LOADERS IS THOROUGHLY ESTABLISHED AND RECOGNIZED. EVERY SKAGIT IS ENGINEERED AND BUILT TO MAINTAIN THAT REPUTATION.

This folder illustrates the wide selection of Skagit Logging Hoists and their adaptation to some of the most commonly used cable logging systems.

SKAGIT STEEL & IRON WORKS SEDRO-WOOLLEY, WASHINGTON U. S. A.

HIGHLEAD YARDING



A—Main Line
B—Haulback Line
C—Strawline
E—Main Line Block
F—Haulback Block
G—Haulback Corner or Tail Block
K—Chokers
L—Guy Line
M—Pass Line Block
O—Butt Rigging

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

The Highlead System of yarding logs, which is the most commonly used in the Pacific Northwest, is adapted to yarding clear-cut areas of any size timber. Its advantages over other systems are simplicity of rigging, its adaptability to varying conditions and the low capital investment. It can be used for yarding either to a cold deck or landing and also may be used for "swinging," although a skyline system usually is preferred for the latter.

The effective yarding distance depends upon the height at which the main line block is hung and whether yarding is uphill or down. The usual economic yarding distance ranges up to about 800 feet with 1000 feet on the long corners where a square setting is used. The usual setting is about 40 acres.

The main purpose of the highlead, as with the skyline systems, is elimination of hang-ups which would be encountered if the logs were hauled flat on the ground. In highlead yarding a lifting force is provided by the highlead block on a spar tree which allows the logs to over-ride obstacles. For this reason the highlead works better uphill than down, since there is always a lift on the logs in bringing them uphill.

The conventional highlead system can be readily varied to meet special conditions such as taking logs from swamps or along shore lines. The yarder may be mounted on a truck, sled, barge or raft with an A Frame, mast or tower replacing the spar tree.

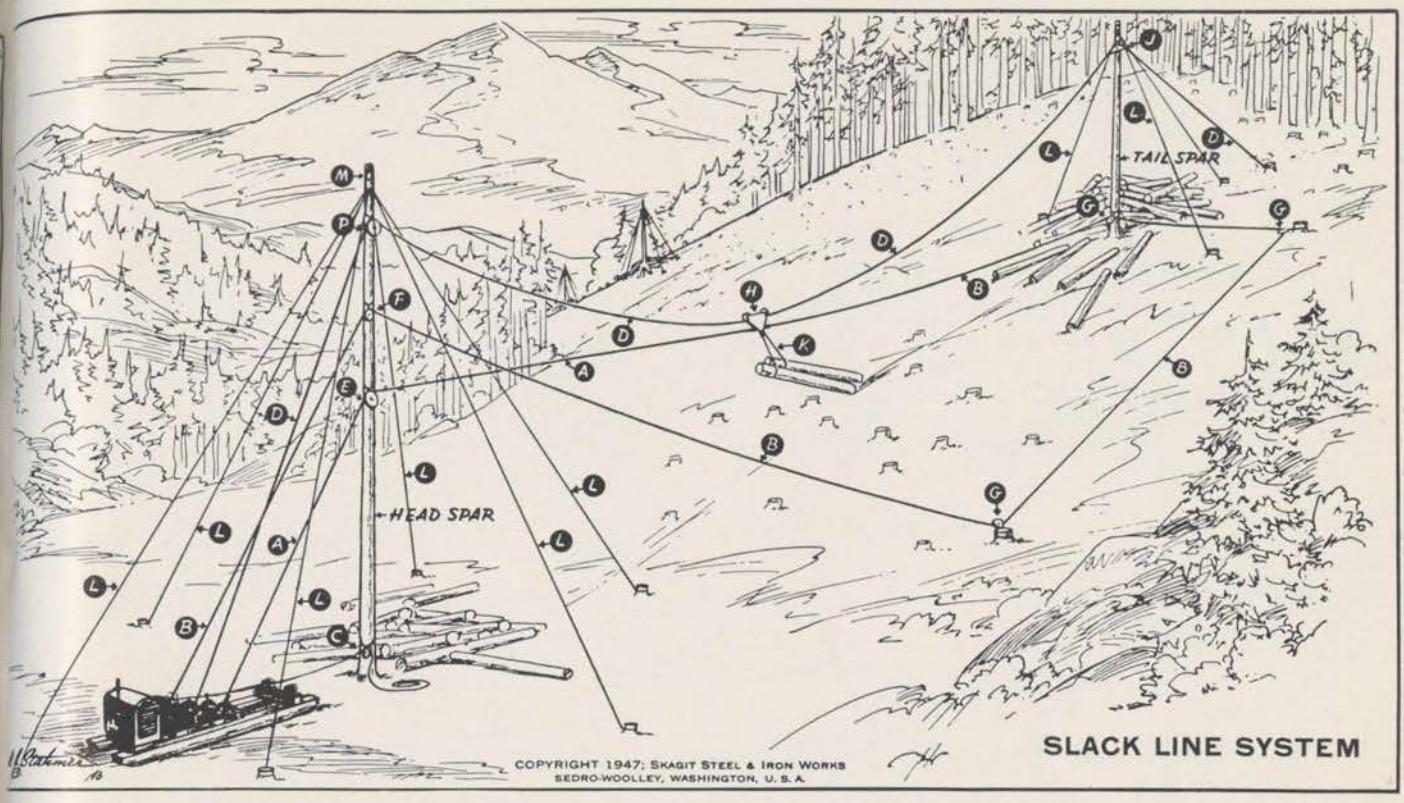
The conventional highlead yarder has main, haulback and straw drums, the latter being used in rigging. The main line hauls in the logs and the haulback returns the main line to the point at which the logs are picked up. Five to nine men usually are used, depending on the size of the operation, rigging, and the production desired.

All SKAGIT Yarders of Series B, BU and BX are used for highlead yarding. Individual conditions determine which size is best suited to logging specific areas.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

SLACK LINE SYSTEM



-Main Line
-Haulback Line
-Strawline
-Skyline
-Main Line Block
F—Haulback Block
G—Haulback Corner or Tail Block
H—Carriage
J—Tree Shoe
K—Chokers
L—Guy Line
M—Pass Line Block
P—Skyline Block

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

The Slack Line System is adaptable for yarding logs or swinging them from a cold deck. It is generally considered the best of the skyline systems for yarding and is widely used for this purpose where topographic conditions require downhill yarding. It also is favored in the redwood region for moving logs across canyons. The illustration shows it set up as a swing system with additional cold decks in the background.

The Slack Line System differs essentially from other skyline systems in that one end of the skyline is wound on a large drum on the yarder and is lowered to hook on the turn of logs and then raised by winding on the skyline drum to lift the logs above obstacles. The other end of the skyline is threaded through a tree shoe and is anchored to a stump beyond the tail hoe. This system requires an additional drum on the yarder to handle the skidding line when the conventional main line is used to operate the slack line. All conventional SKAGIT Yarders with floating main drum gear except the special BU-85 can be equipped with an extra main or skidding drum for the Slack Line System.

Advantages of the Slack Line System are: Greater control of the log since it can be instantly elevated or lowered to accommodate ground conditions by tightening or slacking the skyline; the logs can be raised clear of the ground to minimize breakage of brittle species; "roads" can be changed more quickly than with the tight skyline systems since the slack line can be reeled in with the drum and then pulled out to its new location.

Yarding distances depend upon deflection. Where ground conditions warrant, distances up to 1400 feet are practicable.

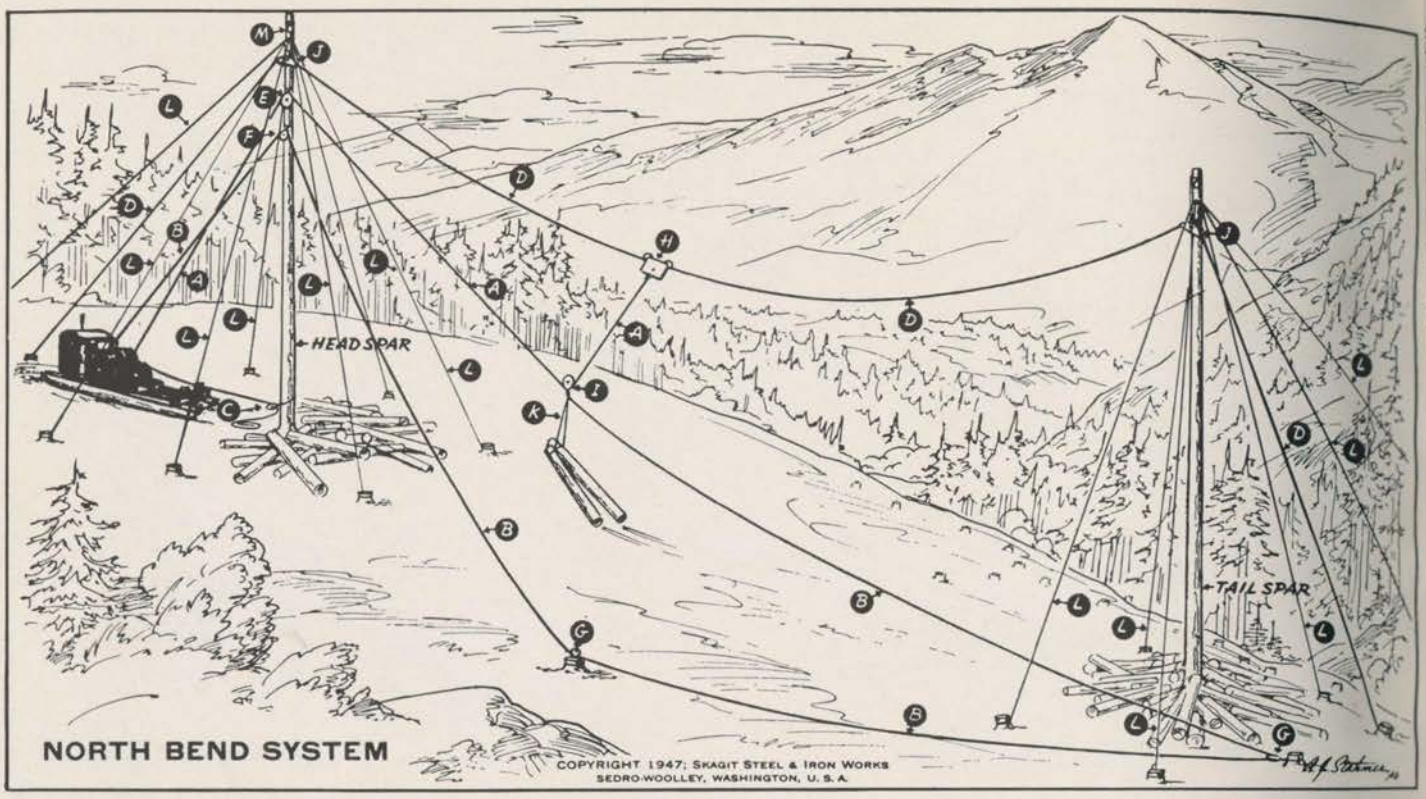
All SKAGIT Series BU and BX Yarders, except Model BU-85, can be supplied with the floating main drum gear and extra drum for slackline yarding. Size of timber, desired production and other factors determine which size is best suited for the specific conditions.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

Skagit

NORTH BEND SYSTEM



A—Main Line
B—Haulback Line
C—Strawline
D—Skyline
E—Main Line Block
F—Haulback Block
G—Haulback Corner or Tail Block
H—Carriage
I—Fall Block
J—Tree Shoe
K—Chokers
L—Guy Line
M—Pass Line Block

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

The North Bend System is the most commonly used swinging system for moving logs from cold decks or hot decks to the landing. Its advantages over the highlead are: Better control of the logs because the skyline confines them to a narrow path, and the avoidance of hang-ups. Its advantages over other skyline systems are that the same yarder can be used as a highlead machine, and it has the simplest rigging of any tight skyline system. The North Bend also may be used as a yarding system, but the time required to rig up the skyline in changing "roads" is a disadvantage compared to highlead or slackline yarding.

It is adapted to uphill, level or moderate downhill slopes. On steep downhill slopes the Modified North Bend is preferred. The distance yarded or swung ranges up to 1400 feet when suitable deflection is obtainable.

In the North Bend, as in all tight line skyline systems, the skyline is anchored to a stump at the tail tree and a stump or heel block drum at the head tree. The load is divided between the main line and the skyline. Ordinarily, the logs drag along the ground, but when an obstacle is encountered, the fall block can be raised by holding the haulback line tight, thereby lifting the turn upward until the obstacle is cleared.

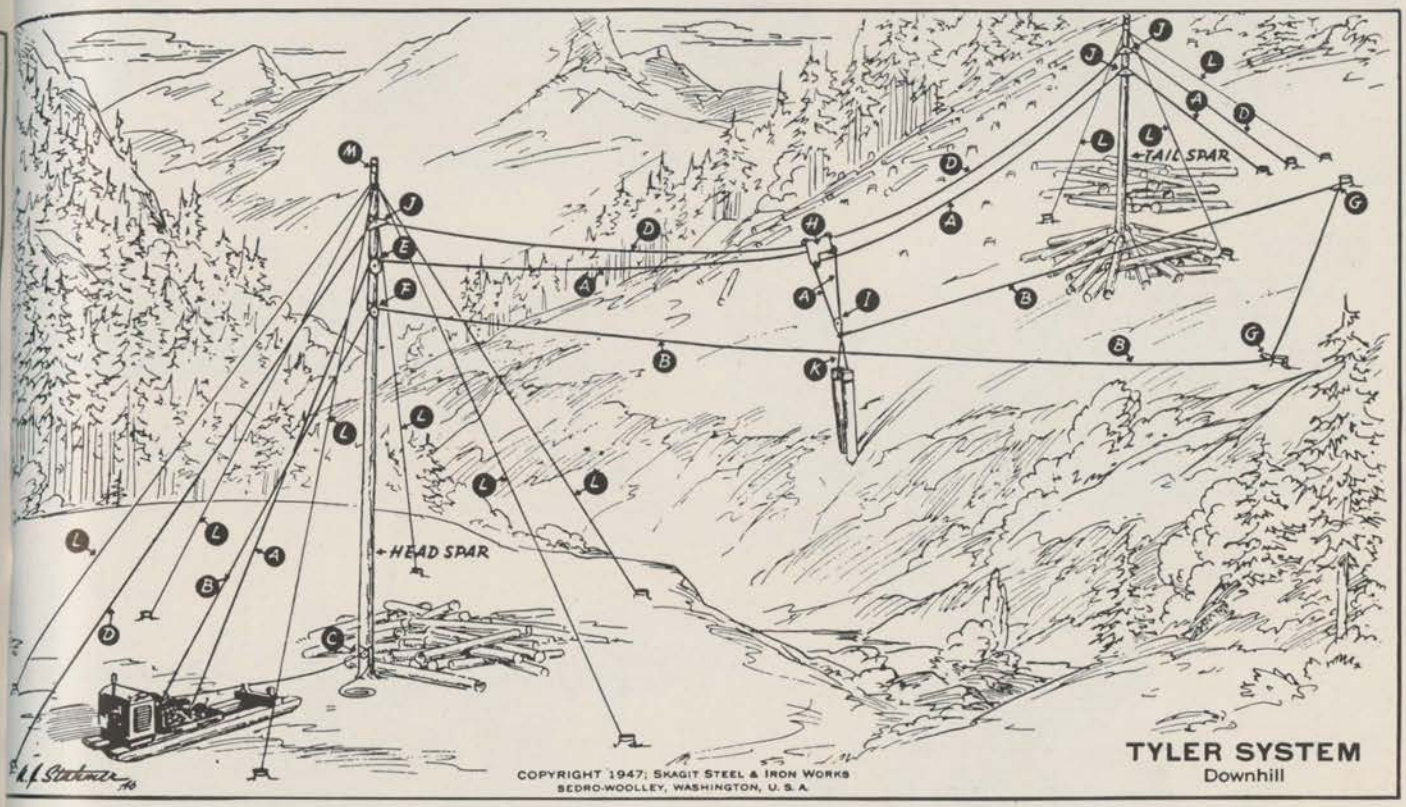
All SKAGIT Yarders equipped with main, haulback and strawline drums can be used for operating the North Bend System. If use of heel blocks on the skyline at the head tree is desired, any SKAGIT Yarder except Model BU-85 can be furnished with an extra drum to spool the heel block line. The size of timber, desired production and other factors determine which size is best suited for specific conditions.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

TYLER SYSTEM

Downhill



—Main Line
—Haulback Line
—Strawline
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—Main Line Block
F—Haulback Block
G—Haulback Corner or Tail Block
H—Carriage
I—Fall Block
J—Tree Shoe
K—Chokers
L—Guy Line
M—Pass Line Block

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering. College of Forestry, University of Washington

On downhill slopes where he carriage will run by gravity when e load is lifted clear of the ground, the Tyler System can be ged to operate by gravity. This permits use of a conventional ghlead yarder, a skidding line drum not being required. The nventional main drum is used as the lifting line. When so ed the descent of the carriage is regulated by braking the load ith the haulback line attached to the fall block.

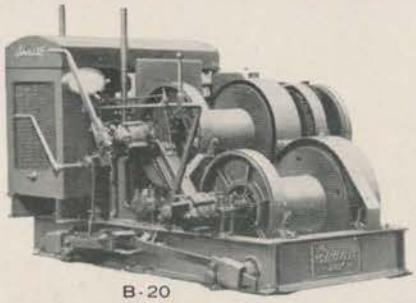
It employs use of a tight skyline. The lifting line is threaded rough the lead block on the spar tree, then through one sheave the carriage, down to a fall block and up through a second eave in the carriage. It is anchored to or beyond the tail e. This lifts the turn clear of the ground. The haulback e is used to control the speed of descent as well as for pulling e block and carriage back to the tail tree. The skyline is fas- ned to stumps at both ends.

This system is used for swinging down steep grades where ffs, canyons and rough ground make it desirable to bring the logs in entirely clear of the ground and where the down slope is sufficient to permit operation by gravity. It can be used for yarding as well as swinging but requires more time to change the "roads" than the Slack Line System.

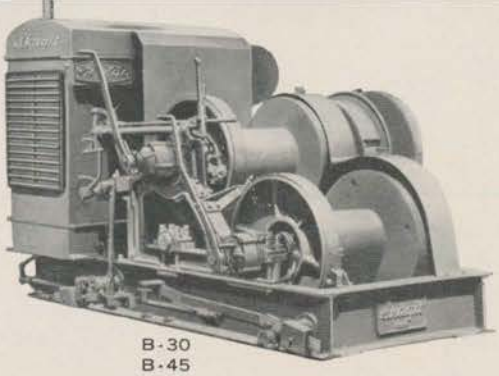
All SKAGIT Series BU and BX Yarders can be used for the Tyler Gravity System.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

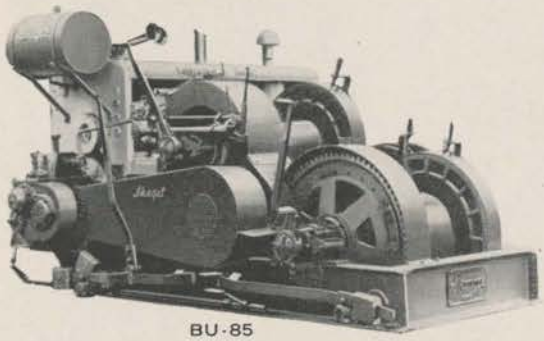


B-20



B-30
B-45

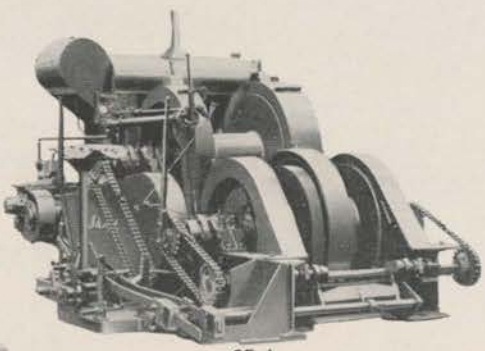
BU-35



BU-85

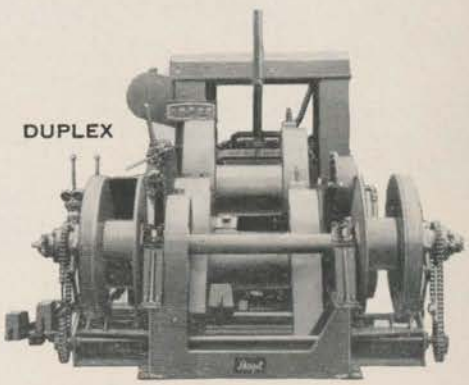
Skagit YARDERS

Built

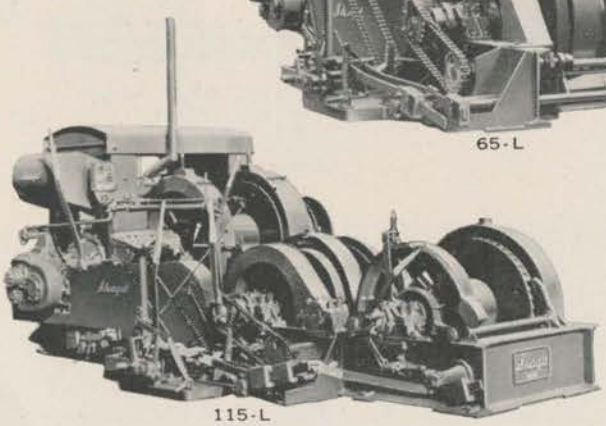


65-L

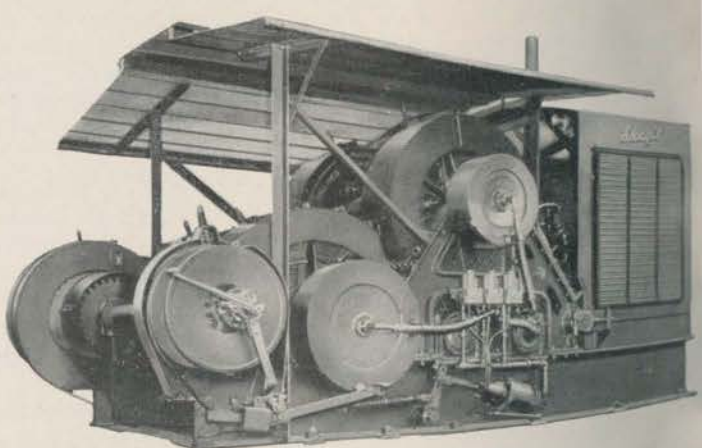
DUPLEX



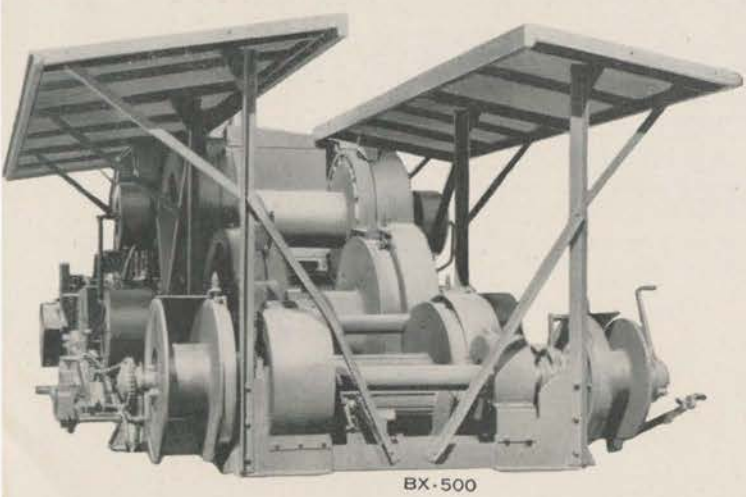
LS-60 LS-70
LS-80



115-L

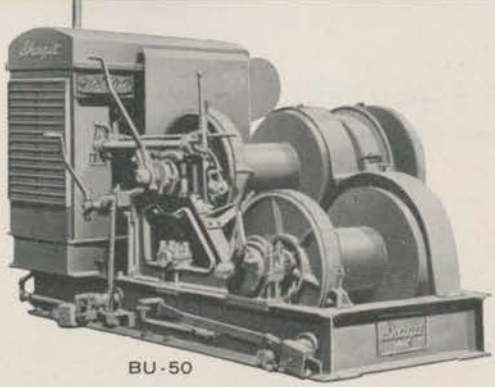


BX-200 BX-300

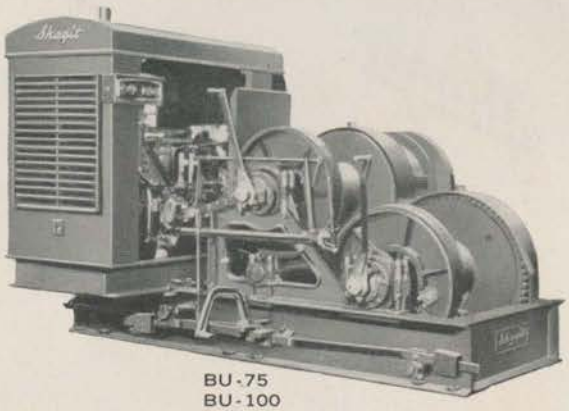


BX-500

Illustrated are representative Skagit models ranging fro
small and medium-sized, manually-controlled machines
the most powerful air-operated Yarders. They are built
meet every requirement of the Logging Industry, and a
equipped with gasoline and Diesel engines rated at 30 to 5
Horsepower, with corresponding drum capacity. Ext
Main, Skidding, Loading, Car Spotting, Utility and Swi



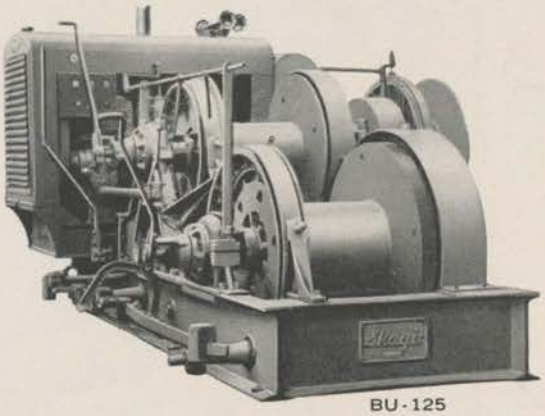
BU-50



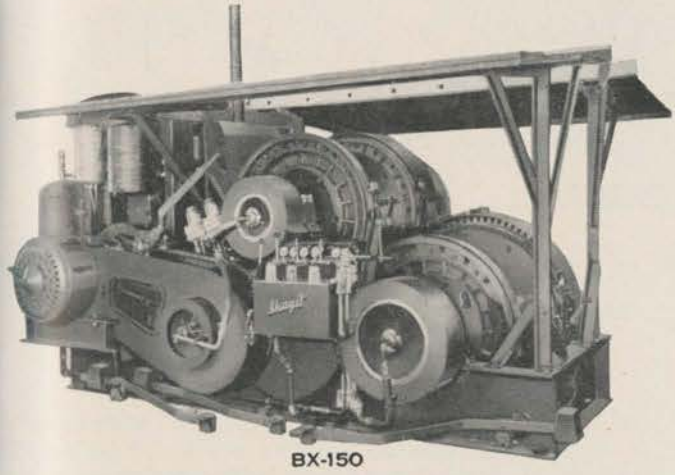
BU-75
BU-100

DDERS-LOADERS

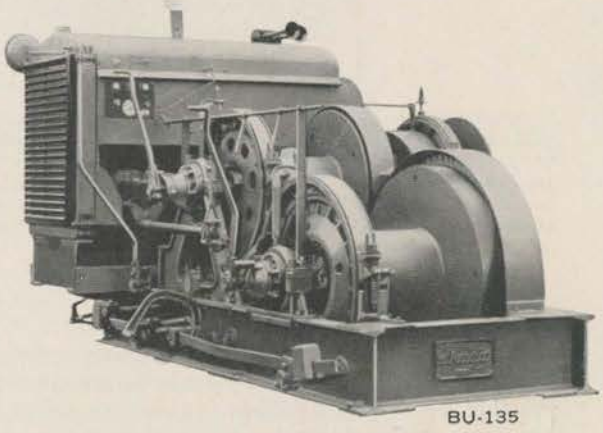
Fit YOUR Job



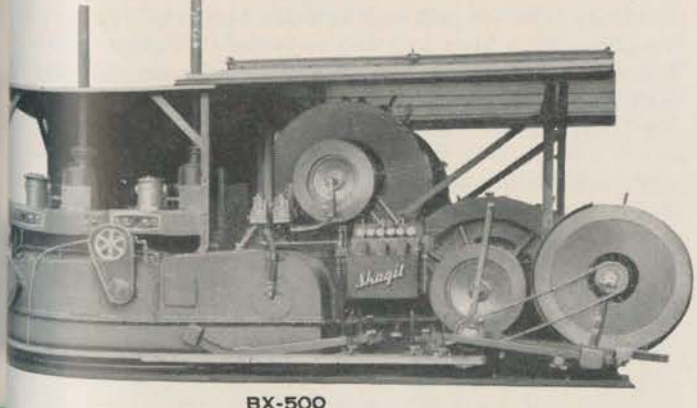
BU-125



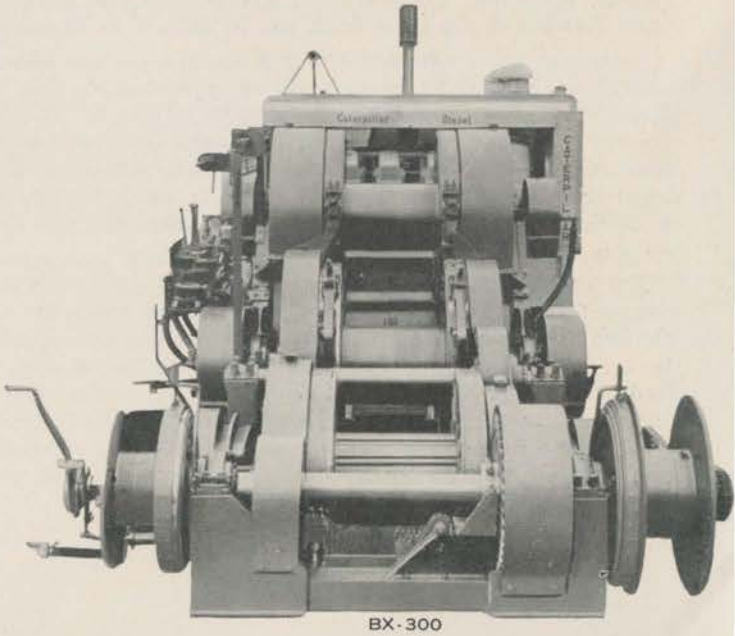
BX-150



BU-135



BX-500



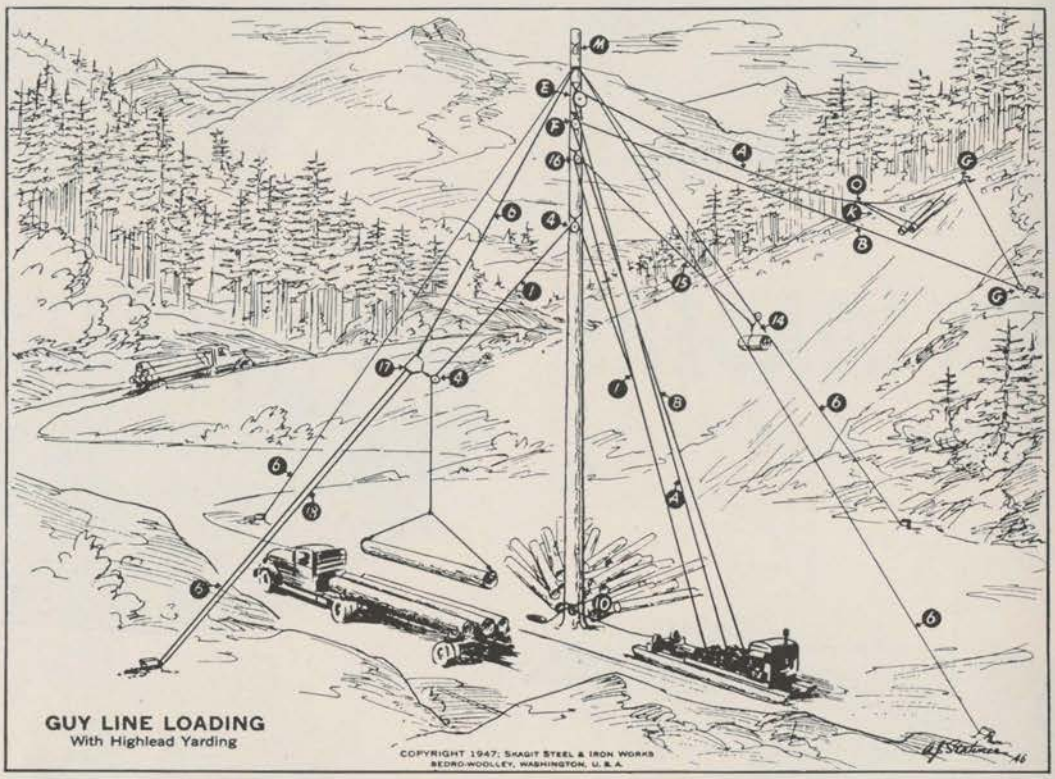
BX-300

can be furnished to adapt these standard yarders system of logging . . . your individual requirements ine which machines fit your job.

eral specifications are shown on back cover. For ad- al details write Skagit Steel & Iron Works or consult Skagit dealer.

GUY LINE LOADING

With Highlead Yarding



1—Loading Line
4—Loading Line Block
6—Guy Line
10—Strawline
14—Counterweight
15—Slack Puller Line
16—Slack Puller Block
17—Loading Jack
18—Jack Guy
A—Main Line
B—Haulback Line
E—Main Line Block
F—Haulback Block
G—Haulback Corner or Tail Block
K—Chokers
M—Pass Line Block
O—Butt Rigging

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

One of the simplest and most inexpensive methods of loading from the standpoint of machine and rigging requirements, is the Guy Line System. When used with a single loading line a one drum machine may be employed or when combined with a yarding operation, a conventional yarder with one additional drum forward of the main drum can be utilized as illustrated.

A loading jack is attached to a guy line in a position where a lead block fastened to the jack will be approximately over the center of the truck or other conveyance to be loaded. The jack generally is fastened to the guy line on its upper end with a chain and clevis; a snubbing line or jack guy is fastened from the lower end of the jack to the same stump to which the guy line is fastened. These keep the jack from sliding up and down the guy line.

The loading line is threaded through a lead block on the head tree and through a block on the jack. To its lower end are clevised two cable straps. On the end of each strap is a loading hook. At a predetermined point on the loading line between the loading drum and the lead block on the tree, is attached a slack puller line, threaded through a block on the head tree to a traveling block on a guy line. To this traveling block is attached a counterweight which will roll off slack on the loading line when frictions and brakes are released on the loading drum.

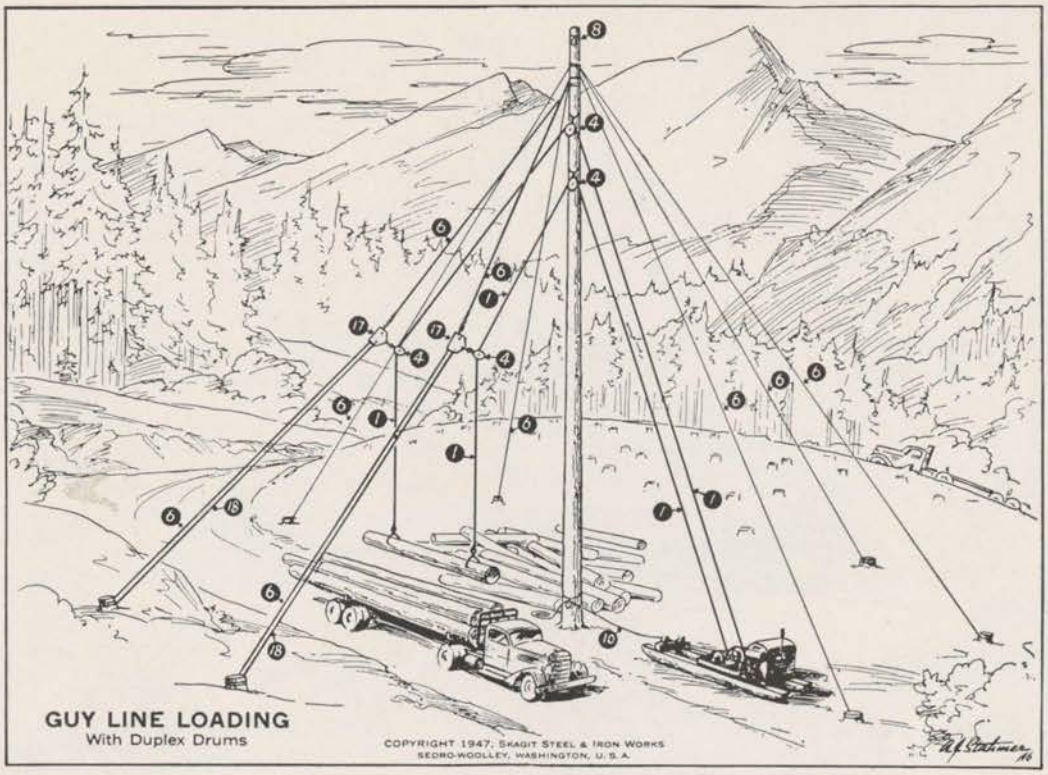
A large log should be placed alongside the road next to the truck to prevent the log being loaded from hitting the truck as it swings from the cold deck or other position. This large log, usually called a brow log, also serves to stop the swinging motion of the log to be loaded. The illustration shows a Highlead Yarding system in combination with the Guy Line Loading, using a conventional yarder with the extra loading drum mounted in front of the main drum. Any standard SKAGIT Yarder, except Model BU-85, can be equipped with the extra drum for combined yarding and Guy Line Loading.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

GUY LINE LOADING

With Duplex Drums



-Loading Line
-Loading Line Block
-Guy Line
8—Pass Line Block
10—Strawline
17—Loading Jack
18—Jack Guy

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

Duplex Loading from guy lines embodies use of a loader hav- g two loading line drums, both with the same speed and power, d generally equipped with a slack roller to provide slack on the ading lines. The drums can be operated independently or sim- ltaneously. A common practice also is to mount outboard on ither drum shaft a small rigger's drum, identified in the il- ustration as a straw drum.

The loading lines lead from the drum to two lead blocks high n the pole, and through secondary lead blocks hung from load- g jacks. A set of heavy tongs is clevised to the end of each ading line.

Loading jacks are fastened to guy lines in such positions that ead blocks attached to them will be approximately over the enter line of the vehicle to be loaded. The upper end of each ack is generally fastened to the guy lines with a chain and levis. To the lower end a snubbing line or a jack guy is clevised nd made fast to the same stump to which the guy line is fas- ened. These keep the jacks from sliding up and down on the uy lines.

To prevent the log being loaded from hitting the truck as it swings from the cold deck or ground, a large log should be placed alongside the road next to the truck. This brow log also serves to stop the swinging motion of the log to be loaded.

This Guy Line Loading System provides better control of the logs being loaded than does the Single Guy Line Method.

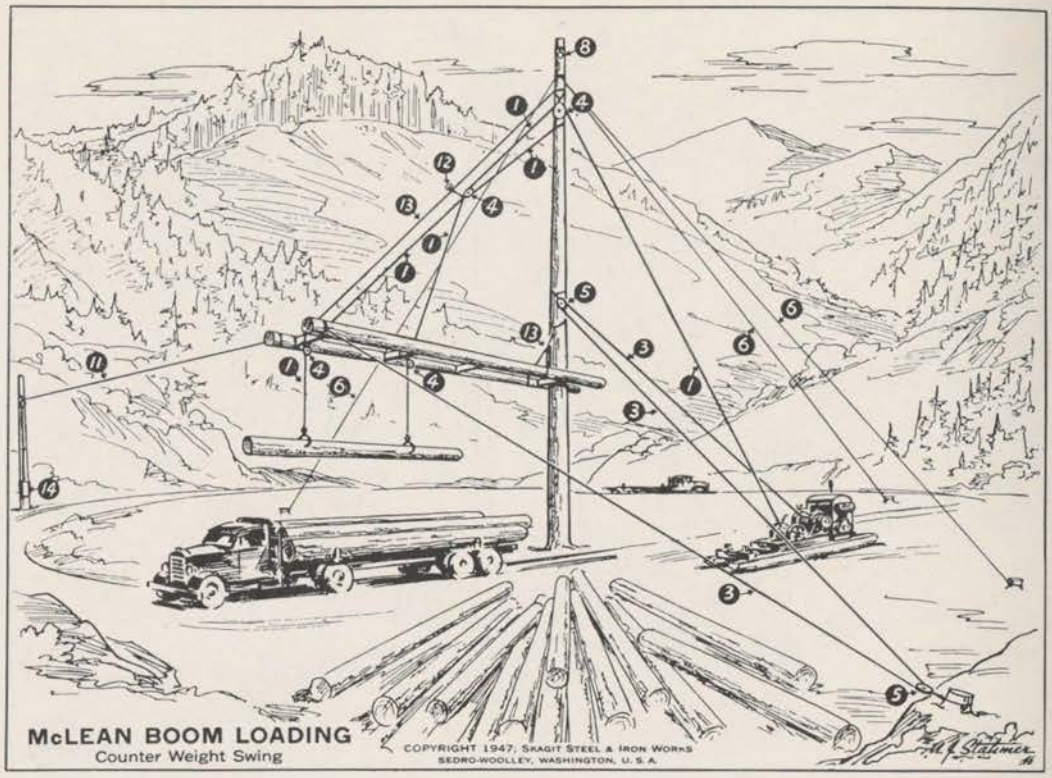
SKAGIT Duplex Loaders are available in two sizes.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

McLEAN BOOM LOADING

Counter Weight Swing



1—Loading Line
3—Swing Line
4—Loading Line Block
5—Swing Line Block
6—Guy Line
8—Pass Line Block
11—Counterweight Line
12—Traveling Block
13—Boom Suspension Guy
14—Counterweight

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

The power loading of logs with the McLean Boom employs use of two sets of tongs. The boom generally is 40 or more feet long and is constructed of two medium size parallel poles with 4 to 6 cross members and suitable buckle braces. The rear end of the boom straddles the head tree or spar and is held in position with a heavy cable bridle. The outer end of the boom is supported by a cable attached to the head tree above the main loading line lead block. On each of two forward cross members is hung a block through which are threaded the tong lines.

In loading, the log is picked up from the ground or cold deck and swung to the position it will occupy on a truck or railroad car. The boom is swung with two lines attached to its outer end.

When a conventional two-drum machine is used, it is customary to employ a powered line for swinging the boom to the position where the log is to be picked up. The line which swings the boom with its log load to the loading position is attached to a heavy counterweight. The amount of swing, travel and speed is controlled by the brake on the drum on which the powered swing line is spooled.

The counterweight sometimes is mounted so that it travels up and down one of the guy lines or up and down the head tree. However, in the promotion of greater safety at the landing, it is better practice to suspend the counter balance on another tree or pole somewhat distant from the landing as shown in the illustration.

The loading line is spooled on the main drum of the hoist. It is threaded through a lead block high in the spar tree, thence through a fall block and is fastened back to the tree just below the lead block. To the yoke of the fall block is attached a traveling or supporting block which moves up and down the outer boom support line. This traveling block should possess sufficient weight to overcome the weight of the loading line in order to obtain slack on the tongs when the brakes on the loading drum are released. The two loading lines also are attached to the fall block.

Any SKAGIT Yarder or Loader with main and haulback drums can be used for loading by the conventional McLean Boom System. When it is desired to yard and load with the same machine, the standard highlead yarder, except BU-85, can be furnished with a loading drum forward of the main drum and with an additional small drum for operating a swing line.

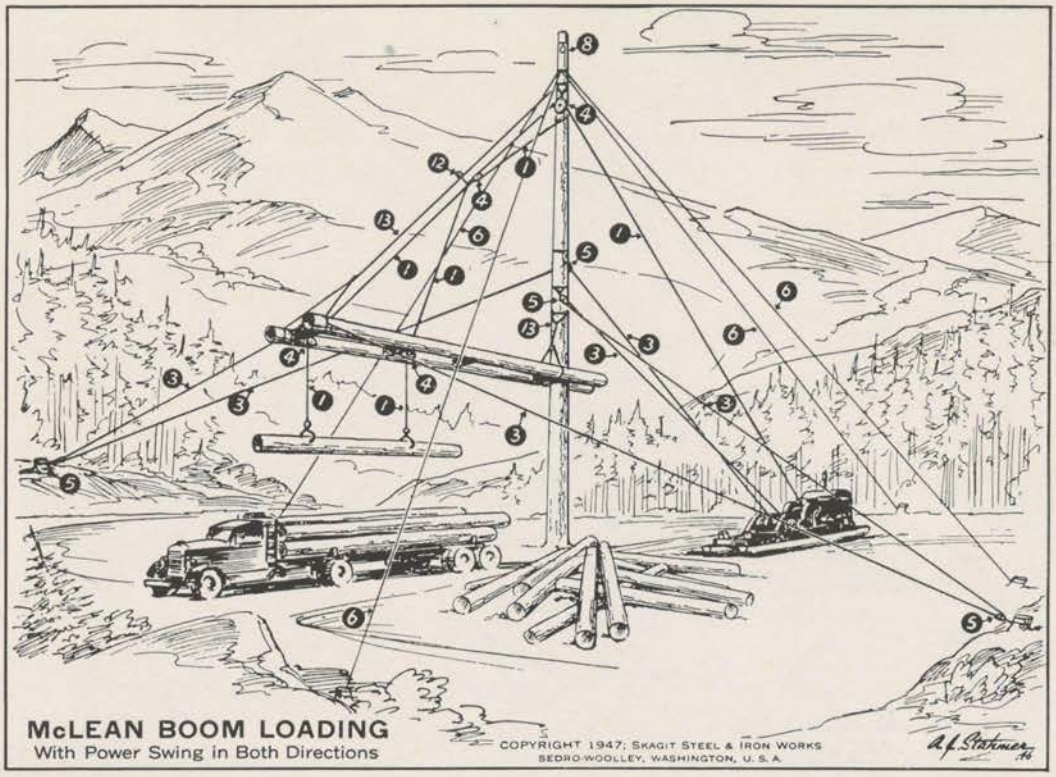
A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

Skagit

McLEAN BOOM LOADING

With Power Swing in Both Directions



-Loading Line
-Swing Line
-Loading Line Block
5—Swing Line Block
6—Guy Line
8—Pass Line Block
12—Traveling Block
13—Boom Suspension Guy

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

To provide maximum control of the boom in loading logs ith the McLean Boom or Heel Boom methods, both swing lines ay be powered. Illustrated is the McLean Boom Loading with wer swing in both directions, using a 3 drum machine. One of ese is used for the main or loading line and the other two as ing line drums. The latter can be mounted either inboard or tboard on a common shaft with the same speed and power each of the swing lines. These swing line drums are provided ith either drag type or equalized type brakes to prevent the ing line on either drum from running away. SKAGIT Loaders this type have all controls in a central location enabling the erator to face the landing at all times. Various size models e available.

The McLean Boom employs use of two sets of tongs. It nerally is 40 or more feet long and constructed of two medium e parallel poles with 4 to 6 cross members. The rear end the boom straddles the head tree and is held in position with heavy cable bridle. The outer end is supported by a cable tached to the head tree above the main loading line lead block. wo tong lines are threaded through lead blocks on the two outer oss members and are attached to a fall block in the loading e.

The loading line is spooled on the main drum and is threaded rough a lead block in the tree, thence through the fall block and fastened back to the tree at a point just below the lead block.

To the yoke of the fall block is attached a traveling or supporting block which moves up and down the outer boom support line and which should possess sufficient weight to overcome the weight of the loading line in order to obtain slack on the tongs when brakes on the loading line drum are released.

In the McLean System, the log is picked up with the tongs and main line to the desired height and is swung over the truck or rail car by swinging the boom. To accomplish this when power is used to swing in both directions on the boom, lines are threaded from the two swing drums through lead and side blocks and attached to either side of the boom at its outer end.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

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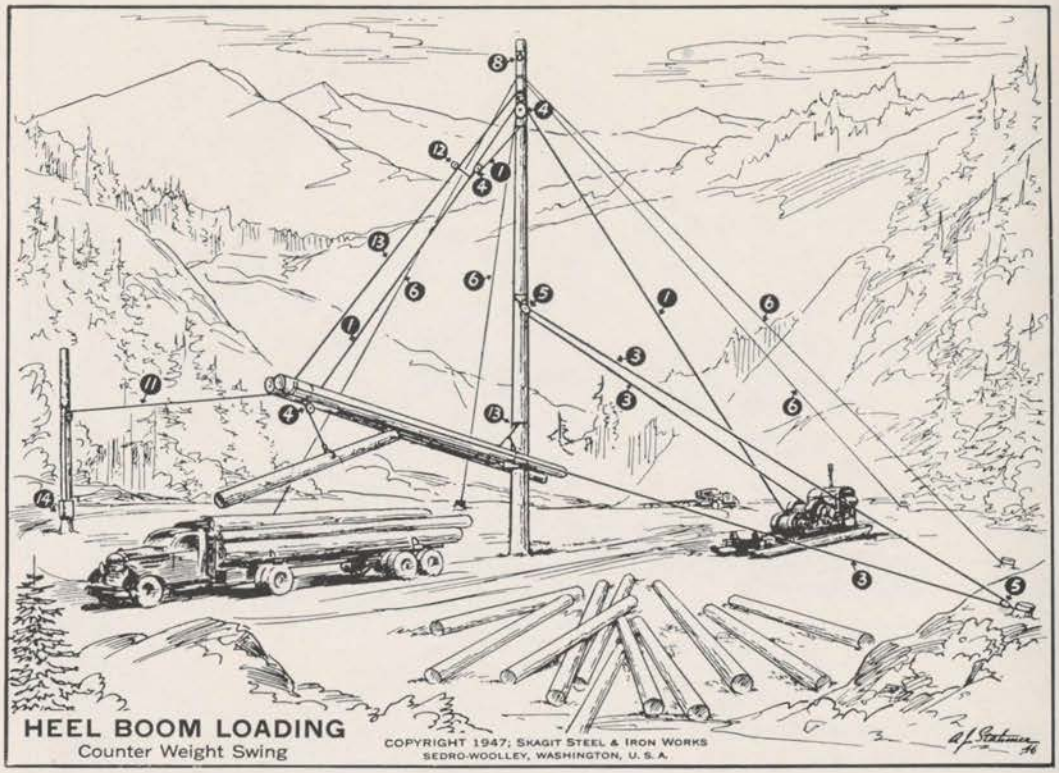
Skagit

HEEL BOOM LOADING

Counter Weight Swing



1—Loading Line
3—Swing Line
4—Loading Line Block
5—Swing Line Block
6—Guy Line
8—Pass Line Block
11—Counterweight Line
12—Traveling Block
13—Boom Suspension Guy
14—Counterweight

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

A loading system which provides very good control over the log being loaded and is a fast operation is the Heel Boom System. It can be set up using a conventional yarder and counterweight swing or with a SKAGIT Swing Drum Loader.

The boom usually is constructed in the shape of a long narrow V with two medium size poles approximately 40 feet long. The open end straddles the head tree. Generally the boom has a minimum of 6 cross members. To the underside of the 4 inside cross members are attached railroad rails with flanges pointing downward. The outer cross member supports the lead block for the loading tong line.

In loading, the tong is attached so that the outer end of the log is heavier, causing the other end to heel against the rails parallel with the boom when the log is raised. The boom then is swung over the vehicle to be loaded and the log lowered into position.

When used with a counterweight swing, any two-drum machine may be used. It is customary to employ the powered swing line for swinging the boom to the position where the log is to be picked up. The line which swings the boom with its log to the loading position is attached to a heavy counterweight; the amount of swing, travel and speed is controlled by the brake on the drum on which the powered swing line is spooled.

The counterweight sometimes is arranged to travel up and down one of the guy lines or up and down the spar tree, but in the promotion of greater safety at the landing, it is recommended practice to rig up the counter-balance to another tree or pole somewhat distant from the landing.

When the boom is equipped with a powered swing line for each direction, a SKAGIT 3-drum Loader with twin swing drums is used, the lines being threaded through lead and side blocks from the twin drums to either side of the boom at its outer end.

The loading line is spooled on the main drum of the hoist and is threaded through a lead block high in the tree, thence through a fall block and fastened back to the tree just below the lead block. To the yoke of the fall block is attached a traveling or supporting block which moves up and down the outer support line and which should possess sufficient weight to overcome that of the loading line in order to obtain slack on the tong when the loading drum brakes are released. The tong line is also attached to the fall block.

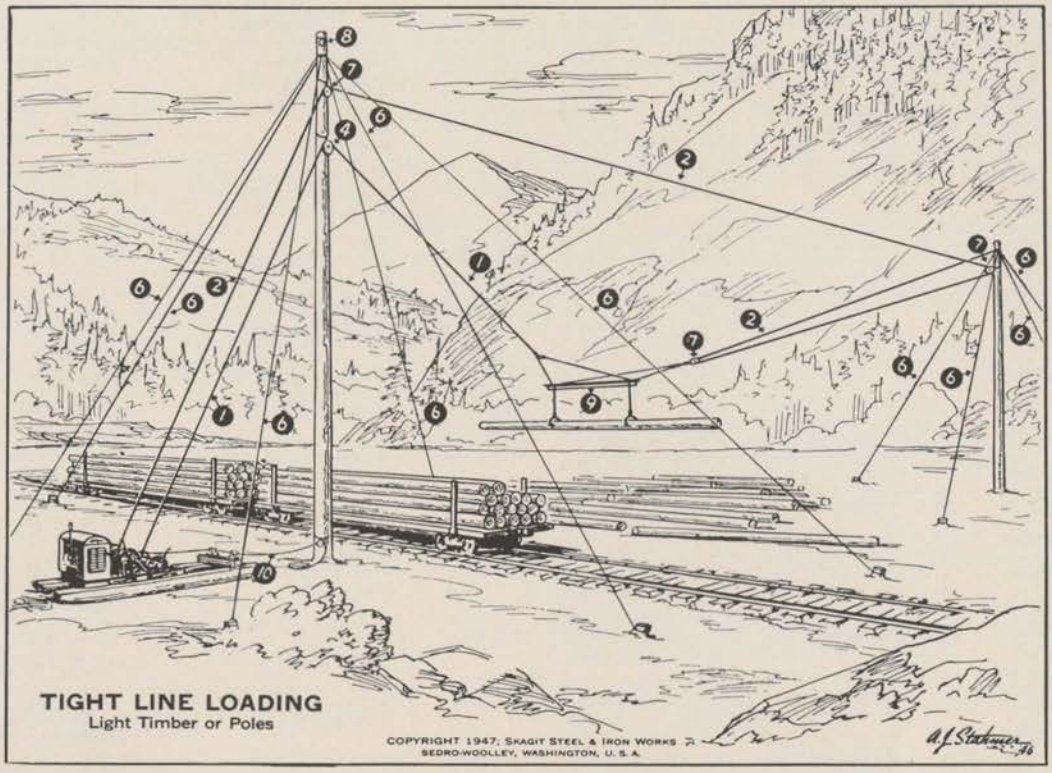
Yarding and heel boom loading with counterweight swing can both be accomplished with a highlead yarder if equipped with a loading drum forward of the main drum and with an additional small drum for operating the swing line.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends of the sled and fastened to nearby stumps.

TIGHT LINE LOADING

Light or Heavy Timber



-Loading Line
-Haulback
-Loading Line Block
6—Guy Line
7—Haulback Block
8—Pass Line Block
9—Spreader Bar
10—Strawline

Prepared for Skagit Steel & Iron Works under direction of J. Kenneth Pearce, Professor of Logging Engineering, College of Forestry, University of Washington

In the loading or cold decking of timber or poles from or to a orage yard, or in loading at a landing, the Tight Line Loading ystem can be employed. It uses two drums equipped with uble brakes on each drum.

For handling small timber and poles, the main or loading line threaded through a lead block on the head pole. In the end the loading line is an eye splice containing a steel ring into hich are clevised two straps, whose length is determined by the ngth of the spreader bar to be used.

For heavier timber, the main or loading line is threaded rough a lead block on the head tree, thence through a main e fall block and fastened back to the head tree, giving a block rchase to the main line.

The spreader bar may consist of a suitable length of heavy eel railroad rail or structural steel such as an I or H Beam. he haulback line threads through a haulback block hung on e pole above the main or loading line block on the head tree, ence through a lead block on the tail tree to a fall block and fastened back to the tail tree. In the yoke of the haulback ll block is a steel ring to which the spreader bar straps are tened in the same manner as they are on the loading line.

On the lower edge of the spreader bar are clevised two straps ch with a set of loading tongs. The load is picked up by e loading line with the haulback brakes set until the required evation of the load is obtained. It then is tight-lined to the or truck by winding in the loading line while slacking the ulback line as required to transport the load horizontally.

A growing practice now is to support the load from above by adding another set of straps to the spreader bar and fastening these to a "bicycle" or traveling block which rides on the haulback line above the load. This requires a higher tail spar to provide the deflection in the haulback line which permits the load to coast in.

In unloading poles or timber from cars or trucks for storage, the spreader bar is spotted above the load. The pick-up is made with the main line and the load tight-lined to its position in the yard by slacking the loading drum brakes and transporting the load with the haulback line.

Any SKAGIT Yarder equipped with main and haulback drums or a two-drum loader will operate a Tight Line Loading System; double brakes are required on each drum.

A pass line, running through the pass line block, is used in rigging the spar tree. On hoists having no utility or rigging drum the pass line is spooled on the straw drum. When not in use both ends of the pass line are secured to prevent pulling out of the block. The straw line is employed in stringing the haulback line into position. Usually the straw line weighs only a quarter to a third as much as the haulback so that it can be pulled out easily by hand. The heavy main line is pulled into position with the haulback.

Sometimes it is necessary to use buckle guys part way up the spar tree to strengthen and stiffen it. These guys are not shown in the illustration. Yarders and Loaders must be anchored in position. This can be done in various ways; the most common method is with anchor cables attached to either front or rear, or both ends, of the sled and fastened to nearby stumps.

Skagit

GENERAL SPECIFICATIONS

SKAGIT YARDERS—SKIDDERS

MODEL	Weight (In Lbs.)	Length (Avg.)	Width Eng.)	DRUM CABLE CAPACITIES			ENGINES	
				Main	Haulback	Strawline	Gasoline	Diesel
BU-15	4000 to 5400	6' 10"	5' 0"	5/8"-855' 3/4"-595'	7/16"-1750' 5/8"-2380'	1/4"-1000' 5/16"-650'	Ford V8, Ford 4 Her. QXC5, IXB5 Wauk. FCU	Cat. D-311
B-20	6500 to 9100	7' 6"	6' 0"	3/4"-1000' 5/8"-1400'	7/16"-2650' 3/8"-3600'	1/4"-2950'	Ford V8 Her. QXC5	Cat. D-311, D-315
B-30 BU-35	8300 to 10500	9' 1"	7' 2"	7/8"-1100' 1" -850'	1/2"-2900' 5/8"-1850'	3/8"-3000' 5/16"-4400'	Ford V8, Her. QXC5 Wauk. BZ, MZA Her. JXD, WXLC	Cat. D-311, D-315 GM-3-71
B-45 BU-50	8600 to 11800	9' 1"	7' 6"	1" -1050' 7/8"-1375'	5/8"-2250' 1/2"-3500'	3/8"-3050' 7/16"-4450'	Ford V8 Wauk. BZ, MZA Her. JXD, WXLC	Cat. D-315, D-318 GM 3-71, 4-71
B-70 BU-75	11800 to 14500	10' 5"	7' 10"	1 1/8"-1000' 1" -1250'	5/8"-2700' 1/2"-4300'	3/8"-3500' 5/16"-5100'	Ford V8 Wauk. BZ, MZA, 140GK Her. JXD, WXLC, RXLD	Cat. D-315, D-318 GM 3-71, 4-71
BU-85 Special	12600 to 14500	10' 0"	7' 10"	1 1/8"-1200' 1" -1500'	5/8"-3450' 1/2"-5250'	3/8"-3050' 5/16"-4450'	Wauk. 140GK, 145GS Wauk. 145GK Her. RXLD, HXC	Cat. D-318 GM 4-71 Cum. HBI
B-95 BU-100	14000 to 17300	10' 11"	8' 2"	1 1/4"-1000' 1 1/8"-1280'	3/4"-2300' 5/8"-3300'	3/8"-3500' 5/16"-5100'	Wauk. MZA, 140GK Wauk. 145GS, 145GK Her. WXLC, RXLD	Cat. D-318, D-8800 GM 3-71, 4-71 Cum. HBI
B-120 BU-125	17000 to 18260	11' 3"	8' 6"	1 1/4"-1440' 1 1/8"-1780'	3/4"-3000' 5/8"-4400'	3/8"-3850'	Wauk. 140GK, 145GS Wauk. 145GK Her. RXLD, HXC, HXE	GM 4-71, 6-71 Cum. HBI, NHBI Buda DC-844
BX-130	19000 to 25000	12' 3"	8' 11"	1 1/4"-1440' 1 1/8"-1780'	3/4"-3000' 5/8"-4400'	3/8"-3850'	Wauk. 145GK, WAK Her. HXE	Cum. HBI, NHBI, NHBIS Wauk. WAKH, WAKD Buda DC-844
BU-135	17600 to 19800	11' 9"	8' 10"	1 3/8"-1250' 1 1/4"-1490'	7/8"-2500' 3/4"-3200'	3/8"-3850'	Her. HXE Wauk. WAK	Cum. NHBI, NHBIS Buda DC-844 Wauk. WAKH, WAKD
BX-140	23000 to 27000	12' 6"	9' 0"	1 3/8"-1250' 1 1/4"-1490'	7/8"-2500' 3/4"-3200'	3/8"-3850'	Wauk. 145GK, WAK Her. HXE	Cum. HBI, NHBI, NHBIS Wauk. WAKH, WAKD Buda DC-844
BX-150	28000 to 33000	12' 8"	9' 2"	1 1/2"-1150' 1 3/8"-1350' 1 1/4"-1650'	7/8"-3400' 3/4"-4650'	3/8"-4825' 7/16"-3550'		Wauk. WAKH, WAKD Cum. NHBI, NHBIS Cat. D-17000 Buda DC-844, DC-1125
BX-200	30000 to 35000	13' 6"	10' 2"	1 1/2"-1250' 1 3/8"-1575' 1 1/4"-1900'	3/4"-4650' 7/8"-3400'	3/8"-4825' (Utility \ 1/2"-750')		Wauk. WAKH, WAKD Cum. NHBI, NHBIS Cat. D-17000 Buda DC-1125
BX-300	38000 to 42000	15' 3"	10' 7"	1 1/2"-1475' 1 3/8"-1750' 1 1/4"-2100'	7/8"-4250' 3/4"-5800'	3/8"-4825' (Utility \ 1/2"-750')		Buda DCS-1125 Twin GM 6-71 Cum. NHBIS
BX-500	54000 to 58000	18' 0"	11' 0"	1 1/2"-1625' 1 3/8"-1950'	7/8"-5200'	3/8"-4825' (Utility \ 1/2"-750')		2 Cat. D-17000 2 Cum. NHBIS 2 Wauk. WAKH, WAKD 2 Buda DC-1125

SKAGIT SWING DRUM LOADERS

MODEL	DRUM CABLE CAPACITIES				ENGINES	
	Loading	Swing (Each Drum)	Rigger	Car Spotting	Gasoline	Diesel
LS-60	7/8"—1100' 1" — 825'	5/8"—1090' 3/4"— 750'	1/4"—2950' 5/16"—1900'	7/8"—1100' 1" — 825'	Ford V8 Wauk. BZ, MZA Her. JXD, WXLC	GM 3-71 Cat. D-315
LS-70	1" —1530' 1 1/8"—1200'	5/8"—1090' 3/4"— 750'	1/4"—2950' 5/16"—1900'	1" —1530' 1 1/8"—1200'	Wauk. MZA, 140 GK Her. WXLC, RXLD	Cat. D-315, D-318 GM 4-71
LS-80	1" —1530' 1 1/8"—1200'	5/8"—1090' 3/4"— 750'	1/4"—2950' 5/16"—1900'	1" —1530' 1 1/8"—1200'	Wauk. 145 GS, 145 GK Her. HXC	Cum. HBI GM 6-71 Cat. D-8800
65-L	1" —1250'	3/4"— 550'	3/8"—1300' 1/2"— 750'	1 1/8"—1025'	Ford V8 Wauk. BZ, MZA, 140 GK Her. JXD, WXLC, RXLD	GM 3-71, GM 4-71 Cat. D-315, D-318
115-L	1" —1250'	3/4"— 550'	3/8"—1300' 1/2"— 750'	1 1/8"—1075'	Wauk. 145 GS, 145 GK Her. HXC	Cum. HBI GM 6-71 Cat. D-8800
DUPLEX (Swing Drums Optional)	1" —1100'	5/8"—1090' 3/4"— 750'			Ford V8 Wauk. BZ, MZA, 140 GK Her. JXD, WXLC, RXLD	GM 3-71, GM 4-71 Cat. D-315, D-318

HELD & McCOY MACHINERY CO.
P. O. BOX 5544 • DENVER 17, COLORADO

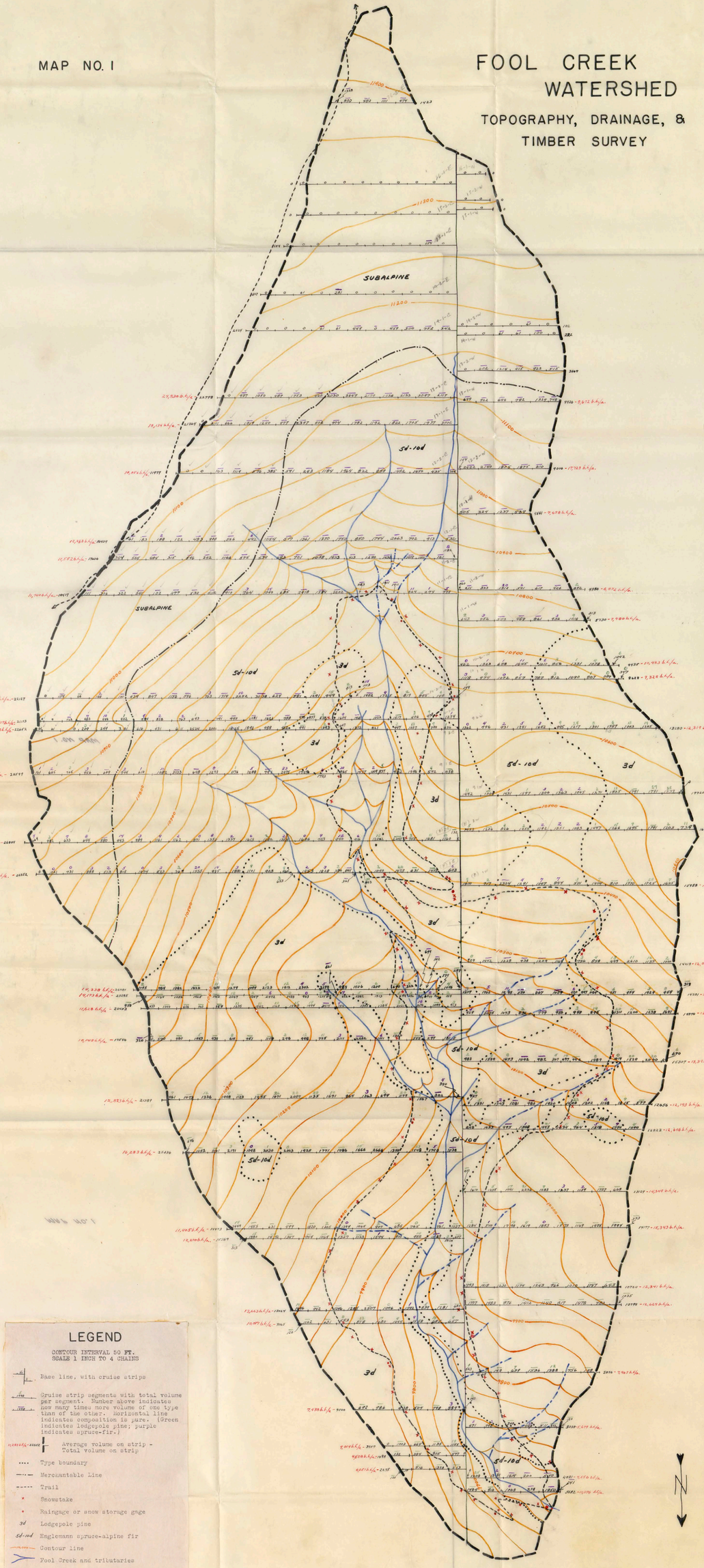
SKAGIT STEEL & IRON WORKS SEDRO-WOOLLEY, WASHINGTON U. S. A.

FORM 319 6M2 3-48

MAP NO. 1

FOOL CREEK WATERSHED

TOPOGRAPHY, DRAINAGE, & TIMBER SURVEY



LEGEND

CONTOUR INTERVAL 50 FT.
SCALE 1 INCH TO 4 CHAINS

- Base line, with cruise strips
- Cruise strip segments with total volume per segment. Number above indicates how many times more volume of one type than of the other. Horizontal line indicates composition is pure. (Green indicates lodgepole pine; purple indicates spruce-fir.)
- Average volume on strip - Total volume on strip
- Type boundary
- Mercantantable Line
- Trail
- Snowstake
- Raingage or snow storage gage
- 3d Lodgepole pine
- 5d-10d Englemann spruce-alpine fir
- Contour line
- Fool Creek and tributaries
- Intermittent tributaries

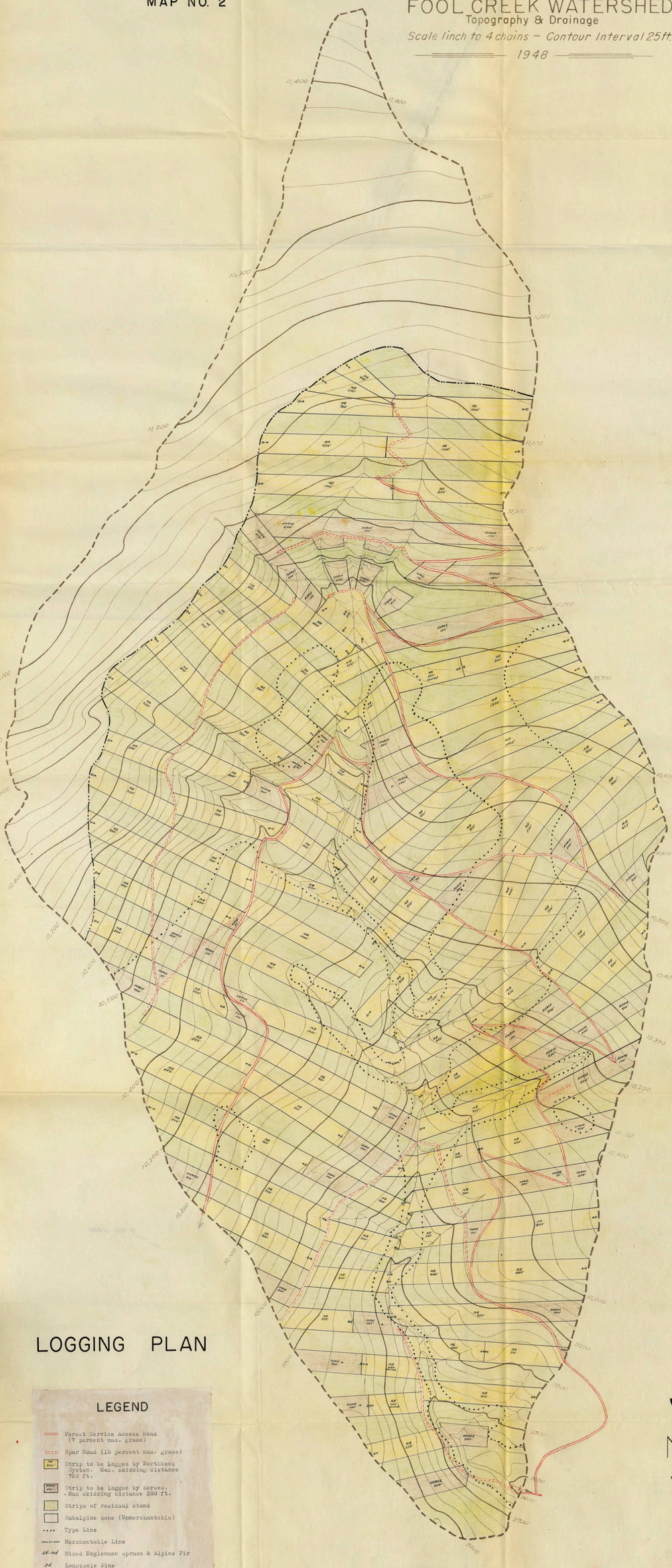
MAP NO. 2

R-2

FRASER EXPERIMENTAL FOREST
FOOL CREEK WATERSHED
Topography & Drainage

Scale 1 inch to 4 chains – Contour Interval 25 ft.

1948



LOGGING PLAN

LEGEND

- Forest Service Access Road (7 percent max. grade)
- Spur Road (15 percent max. grade)
- Strip to be Logged by Northbend System. Max. skidding distance 750 ft.
- Strip to be logged by horses. - Max skidding distance 300 ft.
- Strips of residual stand
- Subalpine zone (Unmerchantable)
- Type Line
- Merchantable Line
- Mixed Englemann spruce & Alpine Fir
- Lodgepole Pine
- Tail spar (Arrow indicates direction of skidding)
- Cold Deck

10-25-38

RESTRICTED

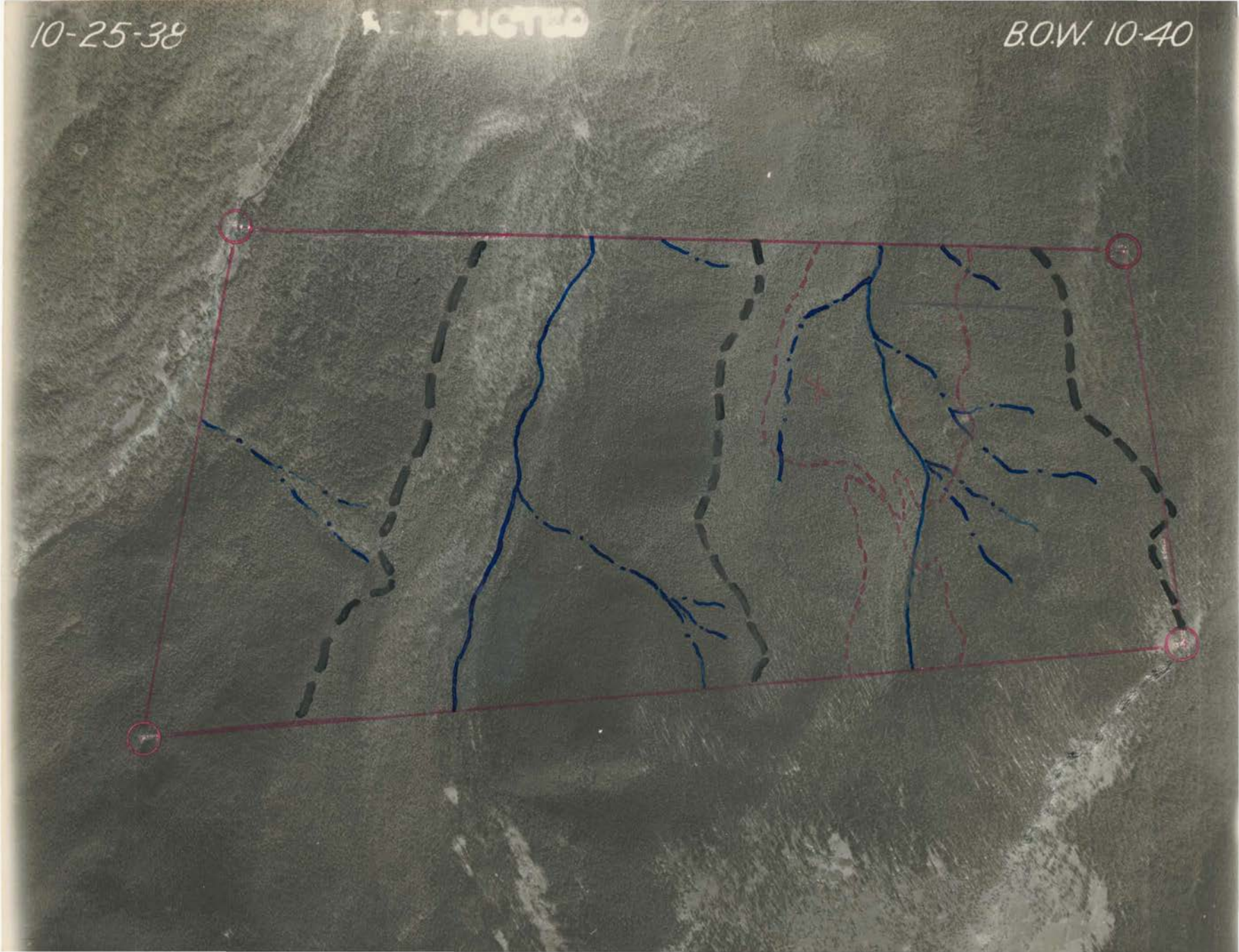
B.O.W. 10-38


10-25-38
B.O.W. 10-39

10-25-38

RESTRICTED

B.O.W. 10-40



10-25-38 RESTRICTED B.O.W. 10-41