B. S. HANDBOOK SER. No. 5

DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
George K. Burgess, Director

AMERICAN LOGGING AND SAWMILL SAFETY CODE

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AMERICAN LOGGING AND SAWMILL SAFETY CODE

A CODE OF SAFETY STANDARDS FOR USE IN LOGGING OPERATIONS AND IN THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF LOGGING RAILROADS AND SAWMILLS

October 12, 1923

PRICE 60 CENTS
Sold only by the Superintendent of Documents, Government Printing Office
Washington, D.C.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

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[1] Deceased.

PREFACE.

This is one of the series of National Safety Codes formulated under recommendations to the American Engineering Standards Committee by the Safety Code Correlating Committee and developed under the plans and rules of procedure of these bodies.

This work was started in 1919, and a preliminary draft was issued in 1920. The criticisms received from the circulation of that draft were incorporated in a second tentative draft issued in August, 1921. Several hundred copies of this edition were sent out to the industry, State officials, and manufacturers of logging and sawmill equipment.

Because of the wide divergence in methods of logging and transporting logs to the mill in various parts of the country it has been necessary to include a large amount of material referring to these operations. Probably no one State or logging area will employ all the methods concerned. They are included to make the code reasonably complete. Sections concerning operations not conducted in any given State should be omitted in making up a State code.

A considerable amount of material has been included that may eventually be covered by separate codes. The use and handling of explosives, overhead cranes, and conveyors are in this class. It is probable that, in subsequent editions, such material will be eliminated and a cross reference made to the appropriate national code. They are included in this edition to take care of some serious hazards which are met with in the lumber industry.

That logging is one of our hazardous industries is shown by the compensation records. Unfortunately, Louisiana, one of the foremost States in the production of lumber, has no compensation law, and accidents are not reported to the State authorities. The Pacific slope represents a logging district where all the States have compensation laws and accidents are reported. Oregon records, for example, show the logging industry to have the highest severity rate of any prominent industry in that State and a frequency rate also among the highest. Consistent application of safety rules should materially improve such records.

Acknowledgment is made of the following sources of material: U. S. Forest Service; Canadian Department of Interior; Industrial Accident Commission, California; Department of Labor, Oregon; State Safety Board, Washington; National Lumber Manufacturers Association; Southern Pine Association; and "Woodworking Safeguards," by David Van Schaack.

A number of illustrations incorporated in the rules are taken from the California safety orders with the permission of the Industrial Accident Commission.

The work of compiling the code has been done chiefly by John A. Dickinson, mechanical engineer, of the section of safety engineering of the Bureau of Standards.

This code has been approved by a Sectional Committee acting under the rules of procedure of the American Engineering Standards Committee.

Following the code is a discussion of the rules which is intended to assist the reader in interpreting the rules and in understanding the reasons for them and to give suggestions for the best means of carrying them out. It is hoped that those having occasion to apply the rules will contribute from their experience to amplify this part of the publication in

future editions. Each rule to which discussion applies has that fact indicated.

The code has been prepared under the sponsorship of the Bureau of Standards, and is approved by it.[2] The bureau will be glad to receive criticisms of code provisions and recommendations for improvement, especially such as are based upon actual experience in the application of its rules. After a period of trial and experience it is expected to issue a new edition, with such changes and corrections as that experience may dictate.

GEORGE K. BURGESS, *Director.*

August 31, 1923.

[2] It has since been approved by the American Engineering Standards Committee as a tentative standard.

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PART III. YARD OPERATIONS.

AMERICAN LOGGING AND SAWMILL SAFETY CODE.

A CODE OF SAFETY STANDARDS FOR USE IN LOGGING OPERATIONS AND IN THE CONSTRUCTION, OPERATION, AND MAINTENANCE OF LOGGING RAILROADS AND SAWMILLS.

SECTION 1. SCOPE AND PURPOSE.

Rule 10. Scope.

This code applies to all logging operations, including the transportation of logs to the mill; to the ordinary sawmill operations, including lath and shingle manufacture but excluding the manufacture of veneer and cooperage stock; to dry kilns and yard operations.

Rule 11. Purpose and Exceptions.

The purpose of this code is to provide reasonable safety for life, limb, and health. In cases of practical difficulty or unnecessary hardship, the enforcing authority may grant exceptions from the literal requirements of the code or permit the use of other devices or methods, but only when it is clearly evident that equivalent protection is thereby provided. Approval of specifications or methods should, when necessary, be based on tests made by an unprejudiced institution of recognized standing with final appeal in such tests to the U. S. Bureau of Standards or the U. S. Forest Service, according to subject.

Rule 12. Mandatory and Advisory Requirements.

The word "shall" is to be understood as mandatory and the word "should" as advisory.

SEC. 2. DEFINITIONS.

Ball-hooting.—The rolling or sliding of logs down a hillside.

Band mill.—A band mill is a mill using a band saw as the main or head saw.

Band saw.—A band saw is a saw consisting of an endless band having teeth on one or both edges so mounted as to run on the circumference of two wheels, the driving power being applied to one of these wheels.

Belt conveyor.—A belt conveyor is a horizontal or inclined belt used to carry materials. The sides may be open or inclosed.

Bolt.—A bolt is a rough sawed or split piece of timber, or a round section of a log generally of short length, to be used for lath, staves, shingles, etc.

Bumper (*buffer*).—A bumper is a device placed at the end of the carriage run to stop the carriage in case of overrun. It is usually a piston fitted within a cylinder which contains a spring, live steam, or air.

Cant.—A cant is a log which has been slabbed on one or more sides.

Canter (*overhead log turner*).—A canter is a machine located above the carriage or the deck and is used for loading logs on the carriage and for turning them when necessary during the process of sawing.

Carriage (*log carriage*) (*saw carriage*).—The carriage is a framework mounted on wheels running on tracks or in grooves in a direction approximately parallel to the face of the saw and provided with apparatus to hold the log securely and advance it toward the saw.

Carriage dog.—A carriage dog is a steel tooth, one or more of which are attached to each carriage knee and operated by a lever. Their purpose is to hold the log firmly on the carriage.

Carriage feed.—The carriage feed is the device for driving the carriage. It may consist of a rack and pinion, a drum-operated cable, or a long cylinder and piston.

In large mills the steam cylinder is used for short carriages and the cable for long ones. In portable mills the rack and pinion or cable feed is used.

Chain conveyor.—A chain conveyor is an endless chain or a series of such chains running over rollers, sheaves, or pulleys used to convey lumber and waste. It may be provided with dogs or lugs.

Circular saw.—A circular saw is a saw whose teeth are located on the circumference of a circular plate.

Circular mill.—A circular mill is a mill using a circular saw as the main or head saw.

Dead rolls.—Dead rolls are cylinders of wood or metal mounted on horizontal axes so as to revolve freely. They are not power-driven.

Donkey.—A donkey is a portable steam engine, equipped with drum and cable, used in steam logging.

Edger.—An edger is a machine, usually power fed, containing two or more ripsaws mounted on a common arbor, with provision for varying the distance between them, and is used to square edge or rip lumber.

Edgings.—Edgings is the material removed from the flitch or cant by the edger.

Flitch.—A flitch is a thick piece of lumber with wane on the edge.

Gang mill.—A gang mill is a lumber-sawing machine with a heavy frame supporting a sash which carries straight saw blades. The sash works in vertical slides and is driven by a pitman from below.

Gang saw.—A gang saw is a ribbon of steel from 6 to 10 inches wide and from 44 to 48 inches long, which is toothed on one edge. A number of these saws are stretched in the

sash of a gang sawmill. They cut only on the downward stroke.

Ground skidder.—A ground skidder is a device which transports logs without lifting them clear of the ground.

Headblock.—The headblock is the part of a carriage which holds the log and upon which it rests. The headblock generally consists of a base, a knee, a taper set, and a feeding mechanism.

Hog (*hog mill*).—A hog is a power-driven refuse chopper used to reduce slashings or other waste to a size suitable for rapid burning.

Husk.—A husk is a framework of heavy timber or metal carrying a circular saw and the devices necessary to drive the saw.

Jump saw.—A jump saw is a crosscut circular saw that can be raised or lowered vertically.

Lath bolter.—A lath bolter is a machine provided with one or more circular ripsaws used to saw slashings into bolts suitable for use in the lath mill.

Lath mill (*lath saw*).—A lath mill is a machine provided with a number of evenly spaced small saws used to saw bolts into lath.

Live rolls.—Live rolls are cylinders of wood or metal, mounted on horizontal axes and rotated by power, used to convey slabs, lumber, etc.

Loader.—A loader is a derrick or boom hoist or system of overhead blocks and cables ordinarily used to load logs on cars, wagons, or sleds, but is sometimes used to deck logs at landings. It may be operated by animals or by mechanical power.

Log deck (*deck*).—The log deck is the platform in the sawmill on which the logs remain until needed for sawing. All or part of it may be inclined.

See also Log landing.

Log haul (*log jack*) (*jacker*) (*log conveyor*).—The log haul is a power conveyor used to carry logs from the pond (or ground) to the mill-floor level.

Log landing (*woods deck*).—A log landing is space used to load (or store) logs. It may be along a railroad, tote, or log road or on the bank of a river. The logs are generally piled or "decked" on two or more skids.

Log pond (*pond*).—A log pond is a pool of water used to receive logs and to store them until needed in the mill.

Log turner.—A log turner is a device consisting of three or more steel arms, together with a hook arm (all of which are actuated by steam) used to load large logs on the carriage and to turn them during the sawing operation.

Lumber.—Lumber is the product turned out by the sawmill and generally is applied to all material produced, except lath, shingles, stove wood, and waste.

Main line.—The main line is that portion of a logging railroad over which all completed trains must necessarily pass to reach the log pond or log dump.

Mill.—A mill is the name given the saw which reduces the log to rough-edge lumber, together with the carriage and other apparatus auxiliary to it.

Nigger (*steam nigger*).—A nigger is a power-driven post or rod provided with dogs or lugs used to place logs in position on the carriage and to turn logs during the sawing operation.

Overhead skidder.—An overhead skidder is a device which transports logs through the air with at least one end clear of the ground.

Overhead trimmer.—An overhead trimmer is a trimmer in which the saws are hung above the table.

Reach.—A reach is a rod or beam used to connect two logging railroad trucks.

Rave.—A rave is the rod connecting the journals of a logging truck.

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This term is also used in some localities to describe a form of brace connecting the runners on a sleigh.

Resaw.—A resaw is a band or circular saw equipped with guides and feed rolls used to resaw slabs, cants, or flitches into lumber.

Rock saw.—A rock saw is a small, coarse-toothed saw carried on an adjustable arm in line with the main mill saw.

Its function is to throw out small stones, pebbles, etc., embedded in the log, thus protecting the main mill saw.

Rosser.—A machine on which bark is removed from mill waste suitable for pulp wood.

Saw.—A saw is a plate or ribbon of metal, the edge of which is provided with a series of notches or teeth, that will, when suitably driven, cut other material.

Saw arbor.—A saw arbor is the shaft on which a circular saw is mounted.

Saw guide.—A saw guide is a device for steadying a circular or band saw.

Sawmill.—A sawmill is a plant operated for the purpose of converting logs into lumber.

Saw logs.—Saw logs are sections of the trunk or larger limbs of trees cut to suitable length for sawing.

Saw slabs.—Saw slabs are outside sections cut from the log.

Sawmill machine.—A sawmill machine is any piece of apparatus used in the process of converting logs into lumber.

Set works.—The set works is the machanism on a sawmill carriage by means of which the setter moves the logs into position for another cut after a piece has been cut from the log.

This apparatus is known in some localities as a "ratchet."

Shotgun feed.—(See Steam feed.)

Slasher.—A slasher is a set of saws, together with a table and feed mechanism, used to cut waste lumber (slabs, edging, etc.) into short lengths suitable for burning, or other use.

Skid.—A skid is a timber, smooth log, or metal rail upon which to slide logs while being loaded or unloaded or to store them while awaiting transportation.

Skidder.—A skidder is a power-driven system of cables and blocks ordinarily used to convey logs from the point where they are cut to the place where they are to be loaded for transportation to the mill.

Skid road.—A road or trail leading from the stump to the skidway or landing.

Steam feed (*shotgun feed*).—A steam feed is a long cylinder having a piston which is attached to the carriage and propels it back and forth.

Swamp hook.—A swamp hook is a hook attached to a chain for rolling logs.

Top saw.—A top saw is the upper of two circular saws on a head saw, both being on the same husk.

Trimmer (*trim saw*) (*end trim*).—A trimmer is a machine equipped with one or more circular crosscut saws for trimming the end or ends of lumber. It is generally provided with some means of trimming to fixed lengths and may have hand or chain feed.

Wane.—Wane is the bark or absence of wood on the edge of board, plank, or timber.

Yarder (*yard donkey*) (*yarding engine*).—A yarder is a donkey engine mounted on a heavy sled, used in yarding logs by drum and cable. It hauls logs from the stump to skid road or to a landing, generally for short distances.

Part I. LOGGING.

SEC. 10. FELLING.

Rule 100. Axes, etc.

(*a*) Ax and sledge handles shall be of sound, dense hickory, ash, maple, or material of equivalent strength. The use of second-growth hickory is recommended. (See Discussion.)

(*b*) A stock of ax handles of assorted lengths shall be available for the use of fellers and choppers. (See Discussion.)

(*c*) Wedges of steel or hardwood shall be available for fellers and buckers. (See Discussion.)

Rule 101. Springboards.

(*a*) Springboards shall be of clear, sound material, not less than 8 inches in width and not less than 1 inch in thickness at any point and at least 1¾ inches in thickness on the spur end. Spurs shall be attached by bolts, screws, or rivets. (See Discussion.)

(*b*) Chopping platforms, where provided, shall be of sound material, not less than 8 inches wide and 1½ inches in thickness, securely fastened to suitable supports.

Rule 102. Boot Calks.

Sawyers, fellers, buckers, and swampers should be provided with sharp-calked or hob-nailed boots.

Rule 103. Log Stakes.

Buckers and swampers, when working on hillsides or steep inclines, should make use of pointed hardwood stakes, iron pins, wedges, or chocks with which to hold logs to prevent them from rolling.

Rule 109. Operating Rules.

(*a*) Wedges and hammers which show burrs extending more than one-eighth inch from the body of the tool shall not be used until they have been dressed either on an abrasive wheel or by forging.

(*b*) Wedges and hammer heads, if of iron or low-carbon steel, should be annealed at least once every 60 days.

(*c*) When a tree is ready to fall, the chopper or sawyer shall give audible warning to men working in the vicinity. This shall be done in every case, whether there is believed to be anyone in the vicinity or not.

(*d*) Buckers and swampers shall work at a distance of not less than 500 feet from the sawyers and fellers and at a safe distance from haul-back lines or other cable lines used in steam-donkey logging operations. (See Discussion.)

(*e*) Fellers and choppers shall be warned against working under or around a tree having loose limbs or loose dead bark hanging from it, except when absolutely necessary, and should be instructed to fell any dead trees in the immediate vicinity of their work. (See Discussion.)

(*f*) Great care shall be exercised in working on or around a tree which is "hung up" in another tree or sapling.

Such trees may often be felled by felling another tree against the one lodged, so as to bring it down.

(*g*) Woods bosses shall warn choppers and fellers to watch for kick backs of the butt, particularly when felling trees in a heavy wind. (See Discussion.)

(*h*) If a felled tree balances across a knoll, rock, or log, the light end should be propped before cutting into saw logs.

(*i*) On steep slopes, where there is danger of trees sliding or logs rolling, timber should be felled up the slope and buckers should be cautioned to work on the uphill side of the logs.

(*j*) In ball-hooting, a warning cry shall always be given when the log starts to move.

(*k*) As far as possible, no ball-hooting should be done immediately above sections of skidding road in active use. Whenever it is absolutely necessary to do this, a guard from the ball-hooting crew shall be posted in the road and signals arranged so that ball-hooting shall cease when men or teams are passing.

(*l*) Foreman should issue a warning to all men working in the woods to exercise care in the use of fire, and especially to extinguish matches, cigarettes, cigar stubs, and pipe ashes before throwing them away. (See Discussion.)

SEC. 11. CONVEYING, SKIDDING, YARDING, AND ROADING.

For the protection of conveying and skidding boilers and engines see section 5.

Rule 110. Cables.

Cables used in hauling, skidding, and conveying of logs shall be of such strength as to show a factor of safety of at least 3 under a load that will stall the engine, except where this would require a cable larger than 1⅛ inches in diameter. (See Discussion.)

Rule 111. Sheaves and Fastenings.

The provisions of this rule apply to all yarding, skidding, and hauling engines and pull boats.

(*a*) Pins and fastenings of high-lead sheaves shall have a strength capable of withstanding the force that would be imposed upon them by a tension in the hauling line equal to its rated breaking strength. (See fig. 1, p. 16.) (See Discussion.)

(*b*) When logs are hauled on established skid roads, the tail sheave shall be so guarded that no one may be caught between the sheave and the on-running rope.

(*c*) (1) All sling ropes to which blocks are attached shall be of strength equal to twice that of the hauling line. If necessary, more than one turn of a rope smaller than hauling line may be used. When conditions require a multiplication of blocks, the number of turns of the sling rope shall be increased in proportion to the multiplication. (2) All high-lead sheaves shall be provided with an additional cable or other fastening capable of holding blocks and cables attached to a guy wire or the head spire to prevent the blocks falling on loaders should the fastenings give way.

(*d*) When trees are used for head spars, tail spars, or gin poles, they shall be guyed with cables fastened to other trees, stumps, or to deadmen. The trees used for such work should be carefully chosen, sound, and, if possible, straight grained.

(*e*) The tops of trees used for head spars should be cut off at a point not more than 10 feet above the main cable block.

Rule 112. Brakes.

Hauling engines shall be provided with brakes capable of stopping and holding a load equal to the ultimate strength of the cable, except that engines used exclusively for ground yarding or roading may have brakes capable of just stalling the engine.

Rule 113. Hauling Teams.

Log wheels, sleds, or wagons used for hauling shall be constructed of sound, straight-grained wood and shall show a factor of safety of 6 under maximum dead-weight loading.

Rule 114. Hauling Trucks and Tractors.

(*a*) All exposed gears and moving parts of engines and transmission shall be guarded with standard guards. (See Part IV.)

(*b*) Where chains are used to connect the motive power to the load, such chains shall show a factor of safety of not

less than 10 based on maximum load hauled and on the maximum grade.

Rule 115. Dry Chutes.

(*a*) The logs used in the chute shall be carefully joined at the ends, and the face of the logs shall be trimmed smooth.

(*b*) Except where the chute members are embedded in the ground, cross skids shall be provided at intervals not to exceed 16 feet.

(*c*) Hauling engines and equipment used in pulling logs in chutes shall meet the requirements of rules 110, 111, 112, and the provisions of section 13.

Rule 116. Snow and Ice Roading.

(*a*) *Roads.*—(1) Roads shall be not less than 12 feet in width on straight sections; turns shall be at least 16 feet in width where two horses abreast are used. If four-horse hitch is used with false pole or lead team, the turns shall be not less than 18 feet in width. (2) Unless the downhill side of the road is banked with rock or firm earth to a height of 18 inches, side logs firmly anchored by stakes or pins shall be provided. (3) Turnouts shall be provided not less than 300 yards apart, and a clear-toned bell shall be made part of the harness equipment of each team, unless a separate return (go-back) road is provided.

(*b*) *Snubbing equipment.*—(1) Roads or sections of roads over 50 feet in length, the average grade of which is 15 per cent or over, shall be provided with mechanical snubbers using steel cable, or shall be provided with manila snubbing ropes not less than 1½ inches in diameter, the rope to be snubbed on a sound tree not less than 12 inches in diameter. (2) A supply of gravel shall be provided for the use of "road monkeys" on all slopes of 6 per cent or over unless snubbing lines are used.

(*c*) *Sled construction.*—(1) Sleds shall be substantially made and pinned or bolted together. (2) Tops of bunks on

bobsleds shall be provided with steel spikes extending not less than 1½ inches above the top of the bunk and spaced not more than 3 inches apart. (3) Bunks may be of any width consistent with size of timber and load handled, but shall not extend more than 12 inches beyond sled bar except where used exclusively on level roads, in which case they may extend 24 inches.

(*d*) *Rough locks.*—(1) Each bobsled shall be provided with three rough locks (one reserved for emergency use), and each two-sled outfit shall have three sets of rough locks.

Where the entire descent is controlled by snubbers this requirement may be waived.

(2) Rough locks shall be made of chain, cable, or cable chain, with a minimum diameter of at least three-fourths of an inch.

(3) Rough locks shall be so made that the bight of cable or chain will come under the bar.

(4) Rough locks shall be provided with a secure method of fastening and shall be so designed and installed that they may be quickly and easily released.

Rule 119. Operating Rules.

(*a*) In ground yarding, employees shall not be required to work in the bight of the line when logs are being hauled unless there are sufficient stumps, trees, or other substantial barrier of such height as to afford them protection.

(*b*) An employee required to work aloft on a standing spar or pole shall be supplied with a safety belt.

(*c*) In swamp operations when steel dowel pins are used without cones to fasten tackle to logs men should be warned to look out for flying pins in case of a hang up.

(*d*) All cables used in skidding and hauling should be kept well lubricated to prevent excessive wear of corrosion.

(*e*) Set lines used in conveying should be discarded when the wires are so worn or broken as to make their use hazardous.

(*f*) In ground yarding, employees should be cautioned not to give the signal to go ahead until every man is well out of the way of the log and should be forbidden to remain in front of logs or on the downhill side after the signal to go ahead has been given, or to stand on or ride on logs while they are being hauled in.

(*g*) The yarding crew should be warned not to stand or walk so close to any block that if the line should break the end would whip around and hit them, and should be warned not to go near blocks to oil them when the line is running.

(*h*) Hook tenders should be instructed to watch for and guard against injury by the falling of dry snags or dead tops from trees near the log trail and to see that snipers remove from the logs all limbs that might injure workmen. (See Discussion.)

(*i*) In ground yarding, the main-lead block (jumbo or Tommy Moore) should not be fastened to any object that is not sound and capable of withstanding any strain that is liable to be brought upon it. If a standing tree is used, it should be guyed.

SEC. 12. LOADING.

For the protection of conveying and skidding engines and boilers see section 13.

Rule 120. Log Landing Layout.

(*a*) The maximum clearance between car and brow log shall not exceed one half the diameter of the smallest log handled, but shall not be less than 6 inches.

Rule 121. Location of Donkey Engines.

(*a*) Where practicable, the loading donkey shall be so placed with reference to the landing or rollway that the donkey engineer has a full and unobstructed view of the landing or rollway, and cars.

(*b*) When an independent loading donkey is used in hoisting the logs when loading, it shall be so set as to be entirely clear of the car that is being loaded.

Rule 122. Brakes.

Loading engines shall be provided with brakes capable of stalling the engine.

Rule 123. Cables.

(*a*) Cables used in loading shall be of such strength as to show a factor of safety of at least 4 under a load that will stall the engine.

(*b*) Loading hooks shall be so constructed as to show no appreciable distortion under a load three times as great as that imposed by the heaviest log handled. (See Discussion.)

Rule 124. Sheaves.

Pins and fastenings of all sheaves shall have a strength capable of withstanding the force that would be imposed upon them by a tension in the loading line equal to its rated breaking strength. (See fig. 1.)

Rule 125. Horse Loader.

Cables used on horse loaders shall show a factor of safety of not less than 5 based on the weight of the heaviest log ordinarily handled.

Rule 129. Operating Rules.

(*a*) Loaders shall be sure that brakes are set before starting to load the cars.

(*b*) Loaders shall be sure that car stakes and bunks are securely fastened before starting to load.

(*c*) Loaders shall see that log cars are not overloaded, and that the load is well balanced.

(*d*) In loading logs with a marked taper, loading alternately tops and butts at one end of the car will aid in securing a safe pile.

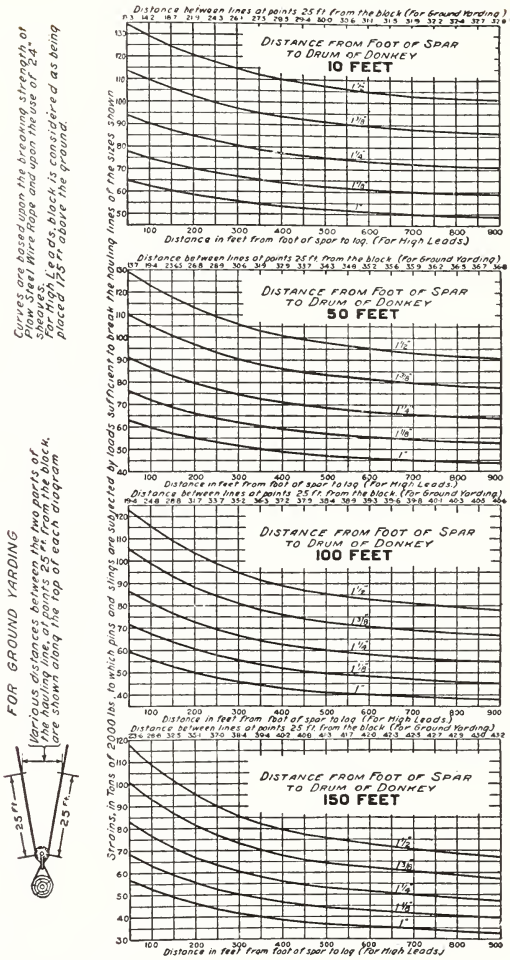


FIG. 1.—*Strains produced on sheave pins and block fastenings for hauling lines in high leads and ground yarding.*

(*e*) An employee required to work aloft on a standing spar or pole shall be supplied with a safety belt.

(*f*) Loaders should not work or stand under logs suspended in the air.

(*g*) The use of a crotch line or two separate tong lines is recommended for loading logs.

(*h*) End hooks should not be used to lift logs scaling over 1,500 board feet. Such logs should be lifted with straps or chokers. (See Discussion.)

SEC. 13. DONKEY ENGINES AND BOILERS.

Rule 130. Application.

Donkey boilers shall comply with existing State rules and regulations, or the requirements of the Boiler Code of the American Society of Mechanical Engineers.

Rule 131. Factor of Safety.

(*a*) The factor of safety for portable boilers shall be not less than 4.5.

(*b*) Strength of tube sheets, stays, and joints shall be computed by formulas given in the Boiler Code of the American Society of Mechanical Engineers.

Rule 132. Boiler Gauges and Safety Equipment.

(*a*) Each boiler shall have at least one water glass, the lowest visible part of which shall be not less than 2 inches above the lowest permissible water level. Water-gauge glasses shall be provided with substantial guards which will prevent the flying of broken glass, unless gauge-glass columns are fitted with automatic gauge-glass cocks which comply with the American Society of Mechanical Engineers rules for automatic gauge-glass cocks.

(*b*) All donkey boilers shall be provided with spring-loaded safety valves of sufficient capacity to discharge all of the steam generated without allowing the pressure to rise

more than 6 per cent above the allowable working pressure. (Boiler Code of the American Society of Mechanical Engineers.) Provision shall be made on each safety valve so that the bonnet may be locked or sealed to prevent any

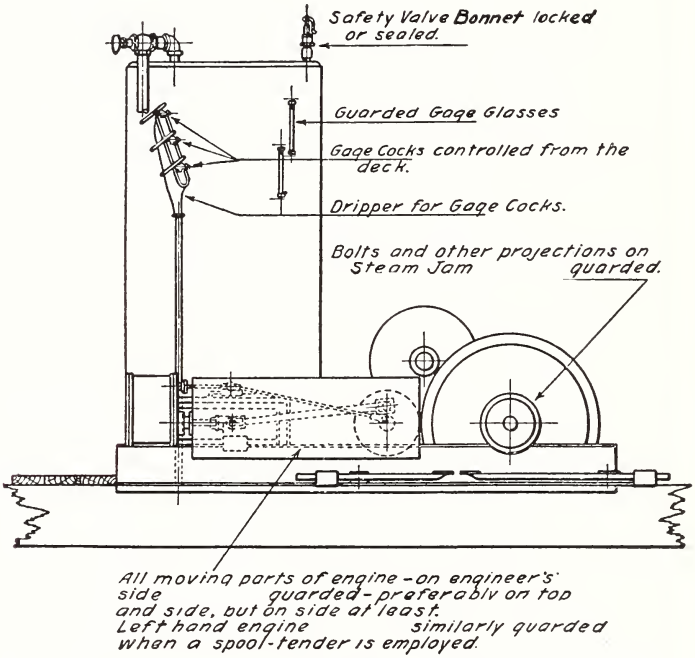


FIG. 2.—*Guards for donkey engine.*

adjustment by other than authorized persons. The bonnet shall be kept locked or sealed except for purposes of adjustment.

(*c*) Each boiler shall have three or more gauge (try) cocks, located within the range of the visible length of the water glass. All try cocks shall discharge into a funnel, dripper, or other similar receptacle which, in turn, shall dis-

charge below and under the main frame. (See fig. 2.) Provision shall be made whereby each of the try cocks can be manipulated by the engineer or fireman while standing on the top of the skids on which the engine is carried.

(*d*) Each boiler shall have a steam gauge connected to the steam space. The gauge shall be connected to an inverted siphon or equivalent device of sufficient capacity to keep the gauge tube filled with water, so arranged that the gauge can not be shut off from the boilers except by a cock placed near the gauge and provided with a T or lever handle arranged to be parallel to the pipe in which it is located when the cock is open. The dial of gauges shall be graduated to not less than 1½ times the maximum allowable working pressure of the boilers.

(*e*) The steam gauge and water gauge glasses shall be so located on the boiler that they can be clearly seen by the engineer as he stands in his normal operating position.

Rule 133. Guarding of Moving Parts.

(*a*) The crank, connecting rod, valve rod, steam-jam cylinder, or other moving parts shall be so guarded as to afford complete protection for the engineer while standing or sitting at his place of duty. (See fig. 2.)

(*b*) Where a spool tender or other operative may be assigned to duty on or at a donkey engine, a shield or screen shall be provided which will prevent his coming in contract with crank, connecting rod, gears, or other moving parts, aside from the spool or drum itself.

Rule 134. Signal Line.

Where a long line is used to operate the whistle for signaling when skidding, carrying, yarding, or pulling, the line shall be carried through eyelets or rings, or other provision shall be made to keep it 6 feet or more above the ground except where trees are being felled in the immediate vicinity.

The use of electrical signaling devices is urgently recommended.

Rule 135. Fire Prevention.

During the season when forest fires are liable to occur the following precautions shall be observed: (1) All donkey engines using wood or coal shall be equipped with effective spark arresters. (2) A space of not less than 100 feet horizontally in every direction from the donkey engine shall be cleared of all dead trees, brush, and other inflammable material. (See Discussion.)

In very dry seasons a 200-foot clearance is desirable.

Rule 139. Operating Rules.

(*a*) The following code of donkey engine signals is recommended for use:

SIGNALS.	INDICATION.
One short (o)	Pull or stop main hauling line.
Two short (oo)	Pull on haul-back line.
Three short (ooo)	Pull slowly on main hauling line.
Two short and three short (oo ooo)	Pull slowly on haul-back line.
Four short (oooo)	Slack both lines.
Four long (— — — —)	Foreman wanted.
Two long and one short (— — o)	Call for water.
Three long and three short (— — — ooo)	Repair man wanted.
Five long (— — — — —)	Man hurt.
One long and one short, repeated four or more times (—o—o—o—o)	Fire.
Succession of short (ooooooo)	Danger signal.

The use of "two short" for pulling main line has been recommended on the ground that a falling limb or an animal coming in contact with the signal cord might give a "one short" and start the line while men are hooking up the load. Several serious and fatal injuries have been reported due to this cause. The change should not be made, however, unless it is made universal throughout a given forest area, either through agreement of State enforcement officials or by common consent of all logging and lumbering associations operating therein.

(*b*) Engineers should examine cables, sheaves, drums, and brakes each morning before starting loaders. If apparatus is not in working condition, repairs or adjustments must be made before the day's run is started.

(*c*) All boilers shall pass an annual internal and external inspection. Stay bolts shall prove sound under the hammer test.

(*d*) When a boiler is to be withdrawn from service the top, heads, crown sheets, tubes, and grate rings should be thoroughly cleaned of ashes and soot to prevent corrosion. Steam gauge and safety valve should be removed and stored in a safe place.

(*e*) Unless boilers are inspected by State, insurance, or manufacturers' inspectors all steam gauges shall be compared with a tested standard gauge at least once each season, and if in error by more than 5 pounds the hand shall be reset.

(*f*) Spark arresters shall be kept in good condition and use at all times when there is any danger of fire in the woods.

(*g*) Engineers should wash the boiler clean every two weeks, clean ashes from ash pits at least once a day, and see that boilers are well filled with water each night before leaving.

For additional boiler operating rules see rule 279.

SEC. 14. LOGGING RAILROADS (TRACK AND ROADBED).

Rule 140. Weight of Rails.

(*a*) Weights of rail used on main line and passing tracks shall be commensurate with the weights of rolling stock and locomotives employed, but in no case shall lighter rail be employed than is specified in Figure 3. (See Discussion.)

(*b*) Rails for loading spurs may be lighter than those specified for main-line tracks by 10 pounds per yard, pro-

vided that in no case shall the weight be less than 25 pounds per yard.

Rule 141. Switches.

(*a*) "Ground-throw" or "jack-knife" switch stands, the movement of which is at right angles to the track, shall conform to the minimum requirements of Figure 4.

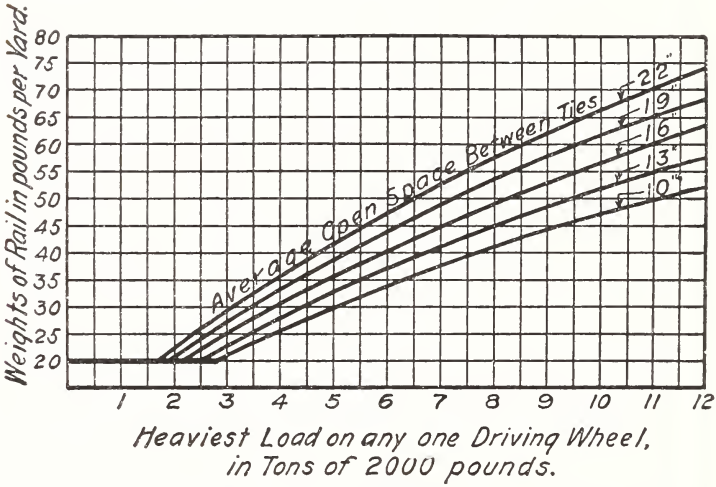


FIG. 3.—*Minimum weights of rail required for various loads on locomotive driving wheels.*

(*b*) All types of switch stands other than "ground-throw" shall conform to clearance requirements of Figure 4. (See rule 143 (*a*).)

(*c*) Where stub switches are used the open space between the ends of the fixed and throw rails shall at no time exceed 2½ inches. Stub switches shall be equipped with head chairs which will insure a fixed spacing between the main and turnout rails.

It is urgently recommended that "parallel-throw" switches be used on logging railroads as far as possible.

OVERHEAD CLEARANCE
No new or rebuilt structure to be within 22'-0" of the rail, unless clearly impracticable. In no case may it be less than 2'-6" above the highest point of locomotive or rolling stock
With the exception of guy lines over loading spurs, any clearance of less than 22'-0" must be protected by rail-poles.
Guy lines should conform to line "X" passing thru points "A" & "B" as minimum. In any event a clearance of 2'-6" must be maintained, and to allow for slacking away and swaying, it is recommended that newly placed lines conform to line "Y" passing thru point "B" as a minimum.

SIDE CLEARANCE.
With the exception of landings in service, no structure or obstruction to be within 2'-3" of end of bunks or sides of locomotive cab. Whichever may require the greater width will govern the side clearance.

SWITCH CLEARANCE
Unless clearly impracticable, "Ground Throw" switches must provide a minimum clearance of 3'-0" from the outside of the rail. Switches of other types must conform to minimum side clearance.

TRACK CENTERS.
Must be such as to afford a minimum of 4'-0" between ends of bunks or sides of locomotive cabs. Whichever may require the greater distance between tracks will govern the track centers.

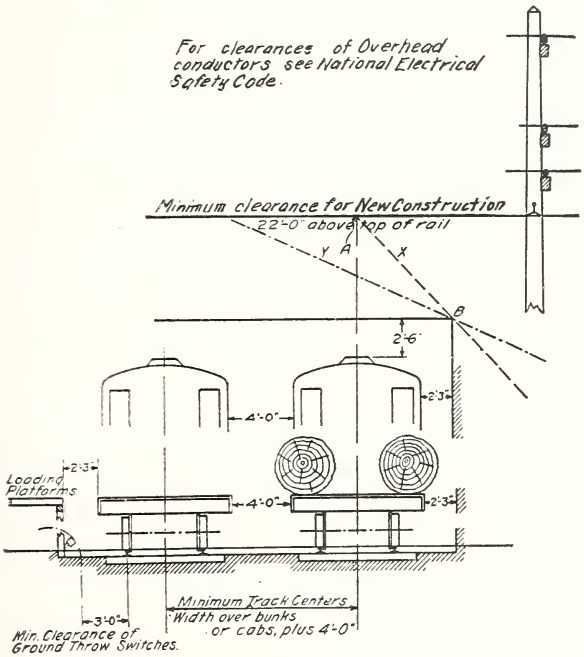


FIG. 4.—*Track clearances for logging railroads.*

Rule 142. Protection of Frogs, Switches, etc.

(*a*) The requirements of this rule shall apply to tracks located in yards, in towns, along log ponds, and to such portions of the main line as are the only available thoroughfare for mill or wood crews.

(*b*) The heel-and-toe crotch and the openings formed by wing rails of frogs shall be so filled as to eliminate the danger of a foot being jammed therein.

(*c*) The crotch or wedge-shaped opening formed between switch point and stock rail shall be so filled as to eliminate the danger of a foot being jammed therein.

(*d*) The wedge-shaped opening at the ends of all guard rails, whether for frogs, curves, or crossings, shall be so filled as to eliminate the danger of a foot being jammed therein.

Rule 143. Clearances.

(*a*) *Main lines.*—With the exception of log landings or rollways (for which see rule 145), all side and overhead track clearances on main lines shall conform to the minimum requirements shown in Figure 4.

(*b*) *Short lines and spurs.*—Logging railroads and spurs less than 10 miles in length shall be exempt from the clearance and construction requirements of main-line tracks, but speeds shall be limited to values suitable for existing clearances and track construction.

(*c*) The distance between centers of parallel tracks shall be such as to conform to the minimum requirements as shown in Figure 4.

(*d*) Snow plows shall be of such a width as to clear a space at least 15 inches on each side of the track beyond the line of cars generally used over the road to afford clearance for switchmen.

Rule 144. Bridges and Trestles.

(*a*) The deck construction of bridges and trestles shall conform to the minimum requirements shown in Figure 5.

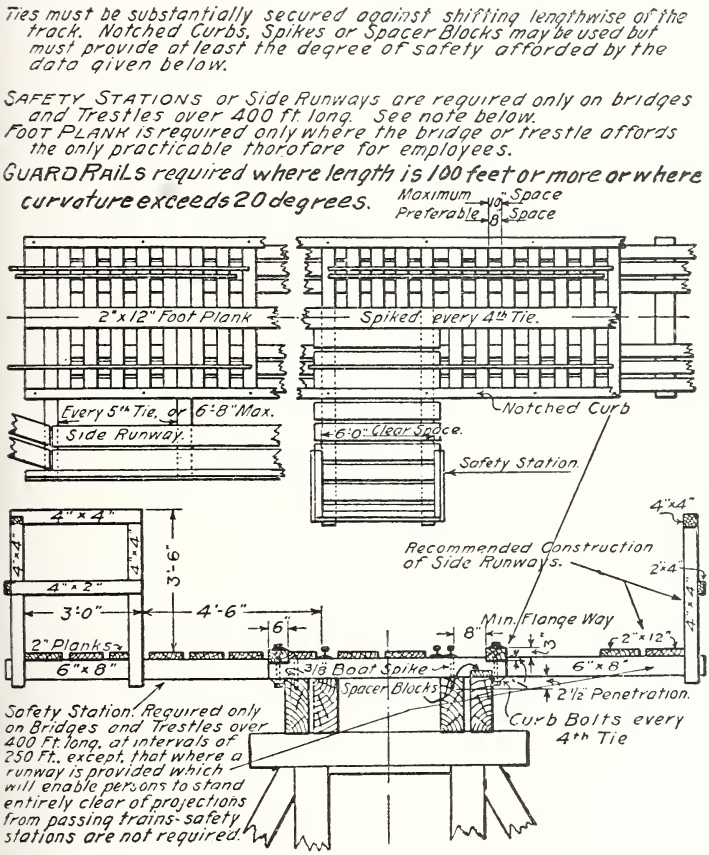


FIG. 5.—*Minimum requirements for deck construction of bridges and trestles.*

(*b*) Where surrounding conditions are such that the bridge or trestle affords the only practicable thoroughfare for em-

ployees, a plank runway not less than 12 inches wide and 2 inches thick shall be provided and maintained and extend end to end of such bridge or trestle.

(*c*) On trestles and bridges whose length exceeds 400 feet an emergency or safety platform shall be provided at points not more than 250 feet apart. These stations shall provide standing room for not less than four persons and be provided with floor and substantial handrails. They shall admit of four persons standing far enough to the side or below to be entirely clear of projections from sides of passing trains. (See fig. 5.)

(*d*) Trestles or bridges which are used as thoroughfares shall be provided with water barrels and fire buckets, these to be either on the bridge or its approaches.

Rule 145. Protection of Log Landings.

(*a*) When necessary to install a log landing or rollway on a main line, warning signs "W" conforming to the requirements of Figure 6 shall be provided and set 400 feet from each end of the landing or rollway and shall be maintained during all of its operation, or until the landing or rollway is torn out or made to conform to Figure 4.

(*b*) (1) Whenever a log landing is served by the main-line track, a derailer shall be installed and used so long as loading is in progress at that place, except as provided in (4) and (5) below. As soon, however, as operations are discontinued at any main-line landing, the derailer shall be rendered absolutely inoperative, even though it may be the intention to resume loading at a later time. (2) Every derailer shall be accompanied by a warning sign placed opposite the rail to which the derailer is applied and conforming to the minimum requirements shown in Figure 6. (3) So long as a derailer is in position on a main-line track there shall be a derailer warning sign alongside of the track, one in each direction and placed not less than the maximum train length from the

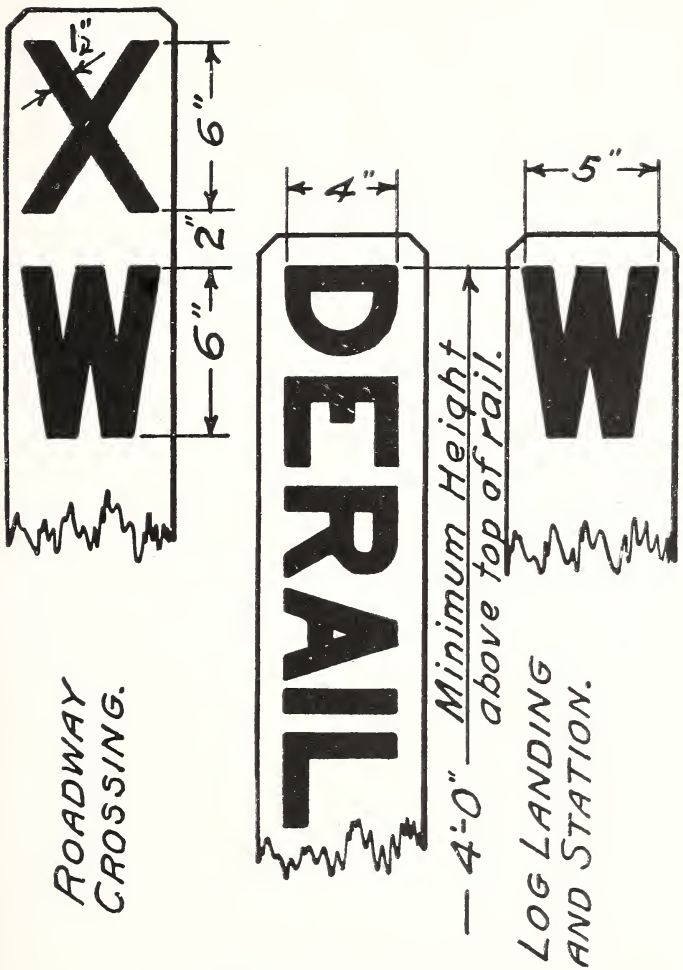


FIG. 6.—*Warning signs for logging railroads.*

derailer. (4) If a log landing which is served by the main-line track is located at the bottom of opposing down grades, or on a track which is level for a distance of not less than six car lengths on either side of the landing, no derailer will be required. (5) It is not required that rollways served only by loading spurs shall be protected as required by (*a*) and (1), (2), and (3) above.

(*c*) After the use of a log landing or rollway on the main line has been discontinued, the landing or rollway shall be torn out or remodeled, so that the clearance requirements of rule 143 are complied with (unless such landing is specifically used for storage purposes).

Rule 146. Protection of Main Line.

Loading spurs and other tracks where cars may be left with the possibility that they may run on to the main line shall be provided with a substantial derailer set to prevent the runaway car from reaching the main-line track. The derailer shall be located far enough from the frog to render unlikely a derailed car interfering with main-line traffic.

Rule 147. Guard Rails.

(*a*) Guard rails, where required, shall be of the same weight as the train rails and shall be securely spiked to every tie. Guard rails shall be not more than 10 inches from the train rail.

(*b*) Guard rails shall be provided on all main-line sections of track where curvature exceeds 25° on broad gauge and 40° on narrow gauge, and wherever the curvature exceeds 20° if the track has a grade of 2 per cent or over.

(*c*) All bridges and trestles, 100 feet or more in length, shall be provided with guard rails.

Rule 149. Operating Rules.

(*a*) Before the first of July of each year all bridge and trestle footings shall be subjected to a thorough inspection,

and any defective material shall be replaced with the least possible delay. Where conditions favor rapid decay, such inspection should be made at intervals of not less than six months. (See Discussion.)

(*b*) A thorough and conscientious inspection of track and roadbed is essential to safe operation and shall be carried out systematically during such portions of the year as any hauling is being done.

(*c*) No inflammable material should be allowed to accumulate underneath timber trestles within 25 feet of any footing or timber.

(*d*) The right of way (including loading space) should be kept clear of inflammable material at all times.

SEC. 15. LOGGING RAILROADS (ROLLING STOCK).

Rule 150. Steam Locomotives, General.

Steam locomotives which conform to the requirements of the Federal safety appliance act and which are inspected by I. C. C. inspectors shall be exempted from the requirements of this section. The Locomotive Boiler Code of the American Society of Mechanical Engineers is recommended where no other specific ruling covers such locomotives.

Rule 151. Locomotives, Factor of Safety.

(*a*) The factor of safety of locomotive boilers shall be not less than 4.5.

(*b*) Strength of tube sheets, stays, and joints shall be computed by formulas given in the Locomotive Boiler Code of the American Society of Mechanical Engineers.

Rule 152. Locomotive Boiler Equipment.

(*a*) Each locomotive boiler shall have at least one water glass, the lowest visible part of which shall be not less than 2 inches above the lowest permissible water level. Water-gauge glass shall be protected by substantial guards which will prevent the flying of broken glass.

(*b*) All locomotive boilers shall be provided with two spring-loaded safety valves of sufficient capacity to discharge all of the steam generated without allowing the pressure to rise more than 6 per cent above the allowable working pressure (Boiler Code of the American Society of Mechanical Engineers).

(*c*) Each locomotive boiler of 35 tons or over shall have three or more gauge cocks (try cocks) located within the range of the visible length of the water glass. Locomotives of less than 35 tons rating may have two cocks. Try cocks shall discharge into a funnel or dripper, which in turn shall discharge below the floor of the cab. If it is desired to keep the tracks from becoming wet, the discharge may be directed into the ash pan.

(*d*) Each locomotive boiler shall have a steam gauge connected to the steam space. The gauge shall be connected to a siphon or equivalent device of sufficient capacity to keep the gauge tube filled with water and so arranged that the gauge can not be shut off from the boilers, except by a cock placed near the gauge and provided with a T or lever handle arranged to be parallel to the pipe in which it is located when the cock is open. The dial of gauges shall be graduated to not less than one and one half times the maximum allowable working pressure of the boiler.

(*e*) Lubricator glasses shall be guarded in a substantial manner.

(*f*) The cylinder cocks of geared locomotives shall discharge downward or between the rails of the track.

(*g*) Injector overflow pipes shall not direct the discharge of steam and water outward from the rails of the track unless the point of discharge is not over 12 inches above the top of the rail.

Rule 153. Locomotive Brakes.

All locomotives shall be equiped with either air or steam brakes operating on the driving wheels.

Rule 154. Lamps.

Provision shall be made on each locomotive for the safe carrying of:

One head lamp.

Only one headlight is specified with the understanding that ordinarily no switching or hauling is to be done after sunset or before sunrise. If switching is done regularly between sunset and sunrise, two headlights shall be provided and both shall be used.

One water gauge lamp.

One steam gauge lamp.

One air gauge lamp.

If air, steam, and water gauges are so located as to admit of illumination by one lamp, only one lamp will be required.

Two hand torches.

A supply of kerosene or other illuminant in addition to that carried in the several lamps. If electric lights are provided, oil lamps meeting the above requirements shall be carried for emergency use.

Rule 155. Safety Equipment.

(*a*) Front and rear footboards and handrails shall conform to the requirements of Figure 7.

(*b*) Guards for the bevel gears of gear-driven (Climax, Shay, etc.) locomotives shall be kept in place and maintained in good condition.

(*c*) All locomotives hauling loads on grades of 2 per cent or over shall be provided with sand boxes and the necessary pipes and operating mechanism, so that the engineer may sand the tracks without leaving the cab.

(*d*) All locomotives operating in districts where there is danger of forest fires shall be equipped with spark arresters.

(*e*) All logging locomotives shall be equipped with ash pans of such design as to prevent the dropping or scattering of hot coals or cinders on the right of way.

Rule 156. Types of Cars.

(*a*) Where cars are interchanged between private logging railroads and common carriers, the standard requirements which govern such common carriers shall take precedence over the requirements of this section.

Two or more Footboards required on each locomotive.
Treads must be of wood, at least 1½" thick, preferably 2".
Footboards may be in two sections, provided each section is not less than 3'-0" long.
If footboard is cut, or notched, or in two sections there must be at least four 1"x3" Wrot. Iron or Steel brackets or hangers
Two end handholds required on each locomotive

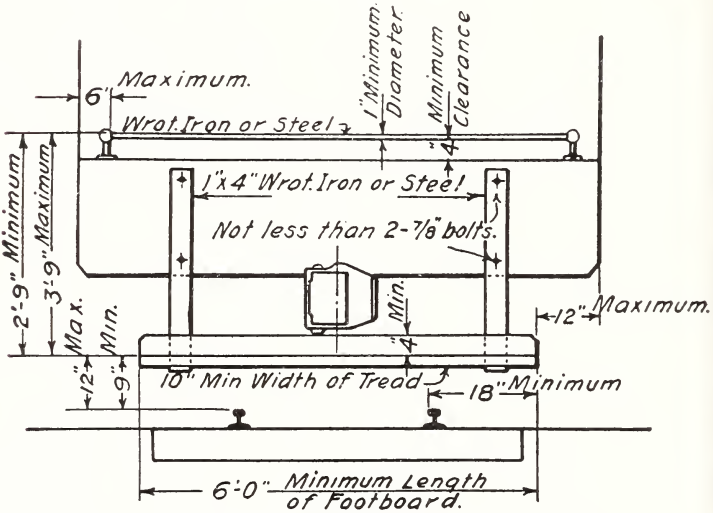


FIG. 7.—*Limiting requirments for locomotive footboards.*

(*b*) A flat or other decked car shall be provided when it is necessary to transport employees or others not members of train crew, so that it will be unnecessary for such persons to ride on cars loaded with logs.

Rule 157. Car Equipment.

(*a*) All log cars shall be provided with log bunks or safety chains, or both.

(*b*) All logging flat cars whose decks are more than 45 inches above the top of the rail shall be equipped with handholds or grab irons and with a step on or at each corner.

It is urgently recommended that all logging trucks be equipped with footboards and grab irons.

(*c*) The raves on log trucks shall be of such size and strength as to withstand ordinary service without distortion.

(*d*) Brake wrenches shall be of forged tool steel and shall be so proportioned that the handle will bend without the jaws yielding enough to slip from a square shank which will just fill the space between the jaws.

Rule 158. Brakes for Logging Cars.

(*a*) All logging cars shall be equipped with brake appliances. Hand brakes shall operate with power brakes, if power brakes are used.

(*b*) The design of the brake shaft shall be such as will insure that the brake chains can not drop under the brake shaft.

(*c*) When cars used in logging-railroad service are equipped with airbrake appliances, provision shall be made for maintaining continuous application of brakes on wheels when required.

Rule 159. Operating Rules.

(*a*) If a locomotive is to be taken out of service, the shell of the locomotive boiler shall be left open and dry, particular care being taken to insure thorough drying out of the water legs.

(*b*) All handholds, grab irons, and steps shall be maintained in serviceable condition.

(*c*) All lamps shall be kept filled and ready for immediate use.

(*d*) Trucks, reaches, couplings, and all logging-car equipment should be inspected and put in serviceable condition every morning before the train is started.

(*e*) In making up trains which are to run over heavy grades it is recommended that a flat car be coupled between locomotive tender and the loaded log cars. (See Discussion.)

SEC. 16. RULES GOVERNING TRAIN OPERATION.

Rule 160. Fixed and Published Rules.

The operation of all trains engaged in the transportation of logs and lumber shall be governed by fixed and printed rules. Such rules shall be developed by each company to meet local needs and shall be diligently enforced by the employer. (See Discussion.)

Rule 161. Crew.

The crew of each locomotive engaged in main-line service shall consist of not less than two men—an engineman and a fireman. (See Discussion.)

Rule 162. Signal Lights.

The following colors and meanings are established as standard:

Color.	Indication.
Red	Stop.
Green	Clear or proceed.
Yellow	Proceed with caution.
Blue	Repair men at work here, stop. (See Discussion.)

Rule 163. Standard Signals.

Standard hand, flag, and lamp signals are indicated in Figure 8.

Rule 164. Whistle Code.

The following engine whistle signals are recommended as standard. The signals prescribed are illustrated by "o"

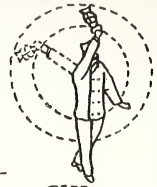
(2) Swung across the track.	Stop. 	(5) Swung vertically in a circle at arm's length across the track when the train is running.	Train has parted. 
(3) Raised and lowered vertically.	Proceed. 	(6) Swung horizontally above the head, when the train is standing.	Apply air brakes. 
(4) Swung vertically in a circle at half arm's length across the track when train is standing.	Back. 	(7) Held at arm's length above the head, when the train is standing.	Release air brakes. 

FIG. 8.—*Standard hand, flag, and light signals.*

for short sounds and "—" for long sounds. The whistle should be distinct and have an intensity and duration proportionate to the distance the signal is to be conveyed.

SOUND.	INDICATION.
o	Stop; apply brakes.
— —	When running, train parted. To be repeated until answered by the signal prescribed by rule 163; also answer to signal prescribed by rule 163.
o o	Answer to any signal not otherwise provided for.
— — —	Release brakes.
o o o	When train is standing, back.
— — o o	Approaching highway crossing at grade.
————	Approaching stations, rollways, chute crossings, junctions, and derailers on main line.
o o o o o o	Air brake sticking.
o o o o o o o	A succession of short sounds of the whistle is an alarm for persons or cattle on the track.
— — — — —	Recall flagman after a stop on the main line.
—o—o—o—o	One long and one short repeated four or more times—fire along right of way. (See Discussion.)

Rule 165. Emergency Stop Signal.

Any object waved violently by anyone on or near the track is a signal to stop.

Rule 166. Log Crossing.

When, in yarding, it is necessary to haul logs across a track, every train shall be brought to a full stop at least 200 feet from the point of crossing, unless given signal by flagman to proceed.

SEC. 17. RIVER DRIVING, RAFTING, AND FLUMING.

Rule 170. Preparation of a Channel.

Where a stream is used for river driving, a log channel should be prepared in times of low water by removing bowlders, stumps, and other obstructions from the bed of the stream. (See Discussion.)

The amount of engineering work done on the river will, of course, depend largely on the length of time that the stream will probably be used and the amount of timber to be brought out. A relatively small amount of labor, however, devoted to improving river beds will not only mean much safer but much cheaper and less troublesome runs when the drive is started. Wherever permanent dams, natural falls, or heavy rapids occur, the use of log chutes or a separate log canal is most urgently recommended.

Rule 171. Driver's Equipment.

(*a*) Cant hooks, peavies, and pike poles used by river drivers should be equipped with handles of dense ash, hickory, maple, or beech, or wood of equivalent strength preferably made from stock split from log to insure parallel grain.

(*b*) All employees engaged in river driving shall be equipped with shoes or boots provided with sharp steel calks.

Rule 172. Rafting.

(*a*) All rafting forms, booms, or docks located over water 5 feet or more in depth shall be provided with a cork, ring-type life preserver with not less than 50 feet of one-fourth-inch line attached to it, such ring to be hung on a post or pole in plain view of rafters. (See Discussion.)

(*b*) All derricks and boom rigs used in assembling rafts shall meet the requirements of steam loaders as given in section 12.

(*c*) Men stationed on rafts which are towed at night shall be provided with signal rockets and a water-tight box in which such rockets and wind-proof matches may be stored.

(*d*) Men stationed on rafts which are towed at sea or on large rivers, bays, or sounds shall be provided with a seaworthy lifeboat. Means shall be provided for securely lashing such boat to the raft.

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Rule 173. Flume Construction.

(*a*) Flumes shall be constructed of sound material. Supporting posts shall not be spaced more than 16 feet center to center and shall be not less than 4 by 6 inches. Curves of 10° or over shall be supported and braced every 8 feet.

(*b*) Runways shall be of not less than 2 by 10 inches and of sound material, firmly fastened to the bracket sills. All portions of the runway 10 feet or more above the ground shall be provided with a substantial handrail.

Rule 174. Loading and Unloading Platforms.

Substantial handrails shall be provided on loading and unloading platforms, except at such sections as are adjacent to the flume and are actually used for loading and unloading.

Rule 179. Operating Rules.

(*a*) As far as possible river-driving crews should be composed of experienced men. These men should be in good physical condition, alert both mentally and physically. Where they are compelled to work on rivers 5 feet or more deep, it is advisable, as far as practicable, to have men who can swim.

(*b*) In laying up log decks along the river they should be decked in regular courses with small skids placed between each course, if possible.

(*c*) In breaking down log decks on a bank of a river the men should be instructed to hold the rear of the course with a peavy or pike pole while the logs are being rolled off from the forward part.

Many large operators are using tongs and lines worked from the opposite side of the stream to break down log decks. This is not only much safer but a faster and more satisfactory method.

(*d*) Where pulp wood and saw logs are being run on the same stream, it is recommended that two separate runs be made if the duration of the spring freshet will permit.

If driven together, the pulp wood will fill up the spaces between saw logs in case of a bad jam and will require a considerable amount of labor under hazardous conditions to clear the river.

(*e*) When breaking up log jams, the men shall be instructed to work from the edge of the stream as far as possible.

Generally, when the logs on the edge have been pulled out, the center of the jam will start very easily and will thus prove less hazardous to the men working on it. A line with tong attached can often be used to advantage in starting king log in a jam. The rope can be handled from shore by man power, team, or portable gas engine.

(*f*) In blowing jams with dynamite, fuses of ample lengths to permit the river men to return to the shore shall be used in making up the primer, or else the charge shall be fired electrically. (See Discussion.)

Manufacturers of blasting supplies are now providing a small pocket-size blasting machine which is extremely portable and practicable for use in the woods.

SEC. 18. USE, STORAGE, AND TRANSPORTATION OF EXPLOSIVES AND INFLAMMABLE LIQUIDS.

Rule 180. Storage.

(*a*) No explosives, blasting caps, cordeau, or fuse shall be stored, kept, or brought into any building used for any other purpose. (See Discussion.)

(*b*) No blasting caps, electric blasting caps, or electric squibs shall be stored in the same building with high explosives or black powder.

(*c*) No magazine shall be used as a thaw house.

(*d*) Explosives shall be stored in bullet-proof magazines of the types shown in the National Explosives Code. The distance of such magazine from the nearest inhabited

building, public road, or roadbed (excepting private logging railroads) shall be not less than those given in Figure 9, except where less distances are permitted by State law. (See Discussion.)

(*e*) Magazines and thaw houses shall be of fireproof construction, or the ground for a distance of 50 feet from the magazine shall be cleared of grass, brush, and all combustibles, and shall be kept clear at all times.

(*f*) All magazines and thaw houses shall be provided with a padlock and be kept locked except when explosives are being stored or withdrawn.

(*g*) No primed explosives (sticks with caps, cordeau, or detonators inserted) shall be stored in any magazine or thaw house.

Rule 181. Thawing.

When the temperature is below 45° F. all dynamite (except low-freezing or arctic dynamite) shall be thawed before being used. Thawing shall be done in thawing kettles or properly designed thaw houses. (See Discussion.)

For thaw-house specifications see National Explosive Code or the specifications of the Institute of Makers of Explosives.

Rule 182. Transportation.

Always obtain a copy of State and local regulations governing explosives, which should be referred to before transporting such materials.

(*a*) Unless specifically covered by local, State, or town ordinances, the following rules shall govern the transportation of explosives: (1) No explosives in excess of 50 pounds shall be transported in a wagon unless the body of the wagon is supported on springs. (2) The wagon shall be painted red or shall carry a sign "EXPLOSIVES" in letters at least 4 inches in height.

(*b*) For transporting cartridges from the magazine or thaw house to the place at which they are to be used, a wooden or fiber box, basket, or pail shall be used.

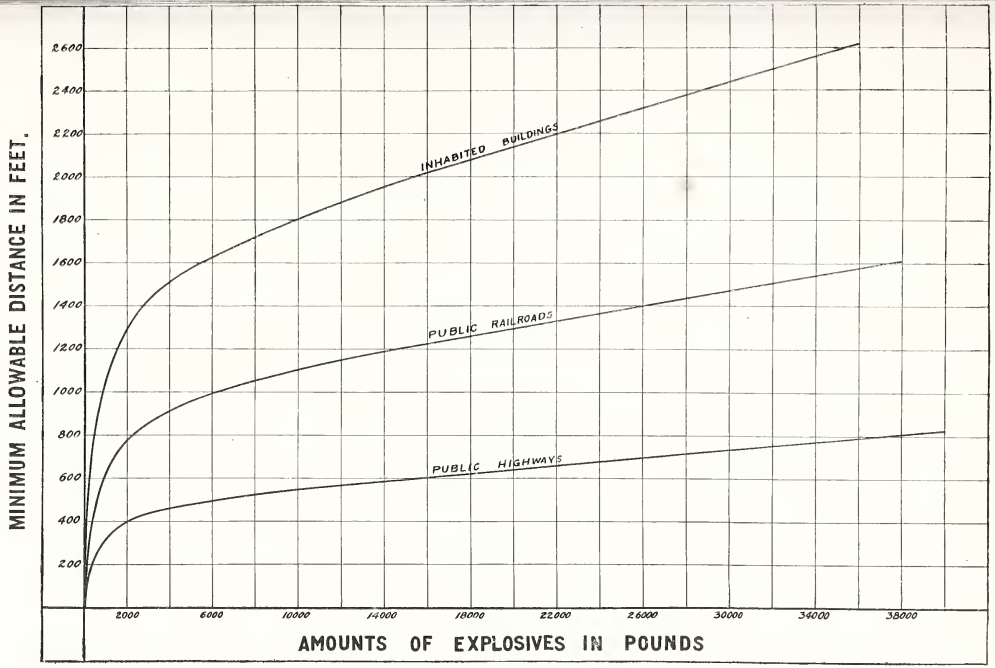

FIG. 9.—*Distances to be maintained between storage magazines for explosives and inhabited buildings, public railroads, and public highways.*

Distances given are for unbarricaded magazines. Where barricades are used distances may be reduced one-half.

(*c*) For the transportation of thawed explosives in very cold weather a double-walled, covered box or container should be provided, the space between the double wall to be filled with sawdust or other heat-insulating material.

Rule 183. Use of Explosives.

(*a*) It is recommended that as far as possible all shots be fired electrically.

(*b*) Where blasting is being done in the vicinity of fellers, buckers, swampers, or teamsters, red flags shall be displayed or guards shall be stationed to prevent anyone entering the danger area.

(*c*) Before a blast is fired a warning signal audible for at least 200 yards shall be sounded sufficiently in advance to permit all men in the danger zone to reach a place of safety.

Rule 184. Transportation of Inflammable Liquids. (See Discussion.)

The following rules apply except where shipments are made on common carriers under the jurisdiction of the Interstate Commerce Commission.

(*a*) Gasoline in excess of 1 gallon shall not be carried on a logging railroad or boat unless it is inclosed in a tight container, except gasoline in the fuel tank of a motor boat or gasoline-driven locomotive or in the fuel tank of automobile trucks or tractors being transported on such railroad or boat.

(*b*) Gasoline in excess of 1 gallon or kerosene in excess of 5 gallons shall not be carried in any car or boat cabin while transporting passengers (anyone other than a member of the train or boat crew to be considered a passenger within the meaning of this rule).

(*c*) Gasoline in amounts over 1 gallon or kerosene in amounts over 5 gallons shall not be carried on any logging train or boat on which passengers are carried unless the following conditions are met: (1) Smoking shall be prohib-

ited while such liquids are being transported. (2) If carried on a train, at least one flat or logging car shall be coupled between the car carrying such liquid and the car carrying any passenger. (3) If carried on a boat, such liquids shall be carried on a deck (preferably aft) covered with sheet metal and provided with a drain discharging overboard, or in a properly ventilated hold separated by fireproof bulkheads from the rest of the vessel. (4) At least three approved chemical extinguishers shall be located near such deck or hold, or other satisfactory means of fighting fire shall be provided.

Rule 185. Storage of Inflammable Liquids.

(*a*) Gasoline shall be stored in underground steel tanks, or in steel tanks or drums above ground, located at least 150 feet from the nearest habited building.

(*b*) Kerosene in excess of 10 gallons shall be stored in underground tanks, or in tanks or drums above ground, located at least 100 feet from the nearest habited building.

(*c*) No gasoline or kerosene shall be drawn from storage after nightfall unless such storage tank or pump is illuminated by permanent electric lights or unless safety electric portable or flash lights are provided.

(*d*) Chemical extinguishers or other approved means of fighting fire shall be located within 100 feet of any above ground storage tank.

Rule 189. Operating Rules.

(*a*) In order that the oldest explosives may be used first, it is recommended that fresh stock be piled in the rear of the magazine, and that explosives be taken out for use from the front of the magazine. (See Discussion.)

(*b*) Any box of explosives which contains leaky cartridges shall be removed from the magazine. (See Discussion).

(*c*) No attempt shall be made to load or shoot partially frozen or frozen dynamite. (See Discussion).

(*d*) If a shot fails to explode, no one shall approach the hole for at least 30 minutes. A delay of one hour is strongly recommended as much safer.

(*e*) If a shot has failed to explode, no attempt shall be made to remove the charge. A new hole at least 6 inches away shall be made for another shot. The detonation of the second charge will fire the first one.

Part II. SAWMILL OPERATIONS.

SEC. 20. MILL DESIGN AND LAYOUT.

Rule 200. General Building Specifications.

(*a*) All sawmill structures, except portable mills, shall be designed to show a factor of safety of 10 for floors and frame. Loads shall be based on manufacturers' weights of machines plus the average load of logs and lumber on the mill floor. Logs shall be estimated at 4½ tons per thousand board feet as scaled; lumber at 2½ tons per thousand board feet as scaled. (See Discussion.)

(*b*) Working stresses in timber frames shall conform to the table of allowable stresses as prepared by the Forest Products Laboratory.

(*c*) All floors shall be of mill construction.

It is recommended, where it is frequently necessary for persons to cross the live rolls, that a bridge be provided over such rolls.

Rule 201. Machine Layout and Clearances.

(*a*) Machinery shall be so arranged that there will be ample room to handle the longest stock cut at any machine without interfering with operators on any other machine. (See Discussion.)

(*b*) A clear thoroughfare shall be provided on one side of the mill from the head saws to the tramway, or else an overhead runway equipped with standard handrails and toe boards shall be provided. (See Discussion.)

Rule 202. Floor Openings.

(*a*) All floor openings, except those located under machines or in the carriage runway, shall be provided with a

toe board 6 inches in height except clean-up holes, which may be left without toe boards if provided with properly fitted covers.

(*b*) The troughs in which the working stands of a conveyor operate shall be provided with toe boards 6 inches in height. If the depth of the trough is over 18 inches or the width 2 feet (regardless of depth), it shall, in addition, be provided with a standard guard rail. (See sec. 40.)

(*c*) When the working strand of a conveyor crosses at or about the floor level in passageways, the trough in which it works shall be bridged the full width of the passageway.

Rule 203. Exits.

(*a*) Mills, the main floors of which are 6 feet or more above the ground, shall have at least two independent exits for the first 50 employees and an additional exit for each 25 employees.

(*b*) Exit stairs shall be at least 30 inches in width.

(*c*) Stairs shall be provided with a standard handrail.

Rule 204. Lighting.

(*a*) Sufficient illumination shall be provided during such time as the mill is in operation so that all parts of machines and runways are plainly visible. The minimum allowable illumination for the mill shall be 1 foot-candle for lath and shingle mills 3 foot-candles

(*b*) The illumination provided for bearings located in the basement shall be not less than 0.75 foot-candle. (See Discussion.)

Rule 205. Oiler's Runway.

(*a*) Overhead runways shall be not less than 18 inches in width and equipped with a standard rail on both sides. If located above a thoroughfare or machine, it shall have, in addition, toe boards 6 inches in height. Access to these runways shall be in all cases by means of fixed ladders or railed stairways.

(*b*) Wherever possible, thoroughfares through basements shall be avoided. If this is impossible, all machines and transmission adjacent to such thoroughfare shall be provided with standard guards.

(*c*) If a passageway or runway pass between the strands of a belt, a substantial covered way with railed sides or other adequate guard shall be provided at the sides.

Rule 206. Ladders.

(*a*) Every isolated overhead bearing for which a runway is not provided shall be reached by a fixed ladder or other safe means of access.

(*b*) Portable ladders used for oiling overhead line shaft bearings shall be provided with metal hooks to fit over the shafting, and their feet shall be equipped with spikes or other device to prevent slipping. (See Discussion.)

The use of self-oiling bearings is urgently recommended.

Rule 209. Operating Rules.

(*a*) The floors in mills and basements, and also in the various other buildings used in connection therewith, shall be kept in good repair and, far as as practicable, free from oil, grease, and débris.

(*b*) Stair treads should be replaced or repaired when the surface or nosing shows wear to the extent of three-eighths inch or more. The treads shall be fastened rigidly in place and shall have no noticeable unevenness or projection.

SEC. 21. ROUGH LOG HANDLING.

Rule 210. Dumping.

(*a*) When conditions of unloading require that an unloading line be attached to logs or cars, or passed under the logs, the equipment shall be such that it will be unnecessary for any person to be on the pond side of the cars after either of the end chains or chocks are released. (See Discussion.)

(*b*) Unless some form of power unloader is used, a rollway or skid timber shall be provided, the upper end of such rollway or skid to be not more than 6 inches below the level of the car platform. (See fig. 10.) (See Discussion.)

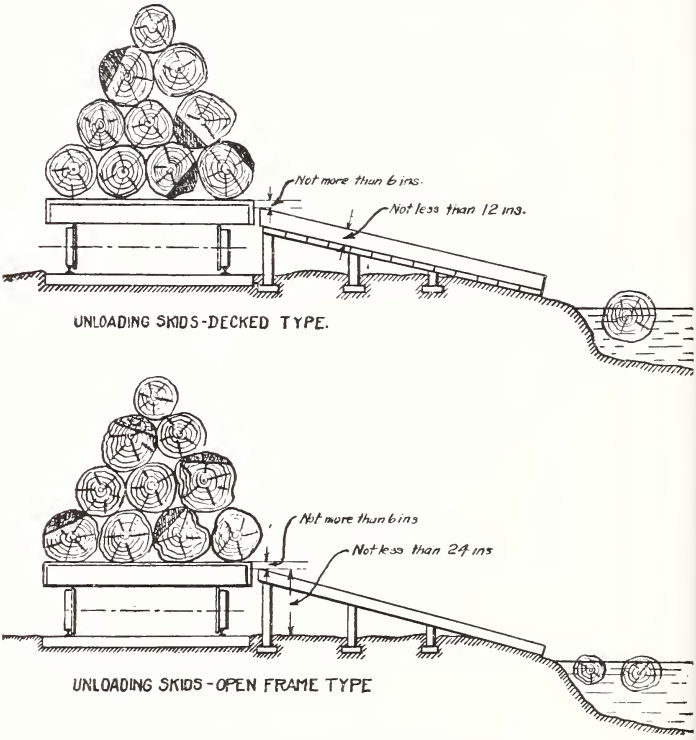

FIG. 10.—*Log unloading skids.*

Rule 211. Log Pond.

(*a*) The banks of the log pond in the vicinity of the log haul shall be reinforced to prevent caving in. (See Discussion.)

(*b*) Pike poles used in pond operations shall be of dense hickory, ash, maple, or wood of equivalent strength and

preferably made of material split from larger stock to insure maximum strength and continuous grain. Saplings of hickory or ash if trimmed smooth may be used for pike poles. (See Discussion.)

A cork-ring life preserver is recommended for all log landings where the depth of the pond is 5 feet or over.

Rule 212. Log Haul (Log Jack, Log Conveyor).

(*a*) The log haul shall be so constructed as to show a factor of safety of 10 when loaded with the heaviest log handled.

Weight of logs shall be taken as 4½ tons per thousand board feet as scaled.

It is urgently recommended that the log haul be lined with sheet iron or that skid rails be installed.

(*b*) Unless clearly impracticable, every log haul shall have at least one runway of sufficient width to enable a person to stand clear of the logs in the chute. The runway shall be provided on at least one side with a standard handrail. (See sec. 40.)

(*c*) All bevel and spur gears used to drive log hauls shall be entirely inclosed. (See Part IV.)

(*d*) Drive belts and frictions shall be guarded in accordance with standards prescribed in section 40.

Rule 213. Log Cut-Off Saws.

(*a*) (1) Where reciprocating log cut-off saws (drag-saws) are provided in new installations, they shall be so arranged that they shall not project into any walkway or aisle. (2) In existing installations projecting parts shall be entirely inclosed by a substantial guard. (3) The drive belts of all drag-saws shall be inclosed with standard guards. (See Part IV.)

(*b*) Circular log cut-off saws for new installations shall be so located with reference to the log-haul runway that

free egress and exit shall be maintained for the building at all times. (See Discussion.)

In existing installations where the cut-off saw is so located as to partially block the entrance from the log-haul runway, the entrance doorway shall be guarded by either of the following methods: (1) A substantial timber projecting between the saw and the doorway. (2) An automatic bar or gate operated by a cut-off saw frame and so located that when the saw is in the operating position the gate or bar is closed.

Rule 214. Log Decks.

(*a*) All log decks must be provided with adequate chocks or other means of preventing logs from rolling down the deck onto the carriage or its runway unless under control.

(*b*) Connecting pins for deck kickers shall be of steel and shall be secured with cotter pins or lock nuts.

Rule 215. Overhead Canter.

(*a*) The gears on the overhead canter shall be inclosed according to the standards prescribed in section 40.

(*b*) Friction drive on overhead canter shall be inclosed according to the standards prescribed in section 40.

(*c*) If the overhead-drive belt and pully are within 7 feet of the floor or platform, they shall be guarded according to the standards prescribed in section 40.

Rule 216. Nigger.

(*a*) Niggers shall operate in metal guides.

(*b*) The use of a spring recoil buffer for the nigger is urgently recommended.

Rule 219. Operating Rules.

(*a*) Points on pike poles shall be kept sharp. Unless provision is made to have pole points sharpened in the mill, files shall be provided for the use of the pond men.

(*b*) If unloading skids are used, there shall always be maintained sufficient space between the top of the skids and the ground to accommodate a man's body.

SEC. 22. SAWING MACHINERY.

Rule 220. Carriage (Log Carriage, Saw Carriage, Feed Carriage).

(*a*) The saw carriage shall be of iron, steel, or heavy timber. If timber is used, it shall be mortised or dovetailed and through bolted. It shall be entirely decked over. (See Discussion.)

(*b*) Cleats should be provided to afford a firm footing for the log setters, or the setters stand shall be covered with corrugated rubber or other antislip material.

(*c*) (1) Means shall be provided for securely locking the sawyer's carriage-control lever when not in use. (See Discussion.)

(2) Where a twin or other steam engine is used exclusively for driving the carriage, a valve shall be placed in the main steam pipe as close to the engine as conditions will permit. This valve must be of a quick-closing type and so weighted or otherwise actuated that it will close automatically when released by the sawyer. Means of releasing the valve shall be provided which will be within instant reach and control of the sawyer.

(*d*) Belts or friction wheels used to drive the carriage shall be guarded according to the standards prescribed in section 40.

(*e*) All bevel and spur gears on the carriage shall be inclosed. (See sec. 40.)

(*f*) Where a log deck is equipped with a steam-operated nigger which turns the logs upward and toward the knees, the latter shall be equipped with goosenecks or extension heads. (See Discussion.)

(*g*) If the carriage is rope driven, the sheaves shall be guarded with a box of heavy timber beveled down to the floor. Sheaves of cables operating rope-fed set works should also be guarded in a similar manner.

(*h*) There shall be provided in each end of the carriage run at least one substantial buffer stop capable of bringing the carriage to a full stop from its maximum speed without dangerous retardation.

(*i*) (1) In new installations the rear edge of the carriage shall be at least 18 inches from the wall or wall timbers, if there is no passageway between them. If there is a passageway, at least 36 inches in the clear between the rear edge of the carriage and the wall or wall timbers shall be provided. (See Discussion.)

(2) In new installations, no roof trusses or timbers shall be located within 6 feet 6 inches of the upper surface of the log setter's platform on any carriage.

(3) Where truss knees in existing installations come within 6 feet 6 inches of the carriage platform, the space between such knees shall be boarded over smooth for at least the length of the carriage travel and to a height of 6 feet 6 inches. Where clearance between the rear of the carriage and frame timbers is less than 18 inches, such frame timbers shall be boarded flush.

(*j*) (1) The carriage run shall be protected by a guard-rail of the same height as the setter's platform, the rail to be of $1\frac{1}{4}$-inch pipe or 2 by 4 inch lumber. (See Discussion.)

(2) A standard guard rail (sec. 40) shall be provided opposite any door which opens on to a passageway in the rear of a saw carriage. Such guard rail shall be at least 18 inches from the rear of the carriage. A warning sign shall be posted on the inside of such door.

(*k*) Substantial guards of metal or hardwood shall be provided in front of each wheel, the guards to extend to within one-quarter inch of the rails.

(*l*) It is recommended that the edges of openings for waste located in the carriage run be hung with loops of 0.625-inch steel chain securely fastened to the sides of the chute, fastenings to be of such strength as to sustain a load of 250 pounds suspended from any loop of chain.

Rule 221. Band Mill.

(*a*) Except for a distance of 1 inch from the front edge, all band-saw wheels shall have a minimum rim thickness of five-eighths inch. It is recommended that all band-saw wheels be trued and balanced while running at full operating speed.

(*b*) No band mill shall be run at a speed in excess of 9,000 feet per minute unless the following conditions are met: (1) It shall be designed and constructed with a factor of safety of 10 for its intended speed. (2) It shall be so cast as to be as free as possible from shrinkage strain and shall be balanced statically and dynamically when running at rated speed. (3) The intended maximum speed shall be stamped in figures not less than one-fourth inch in heighth on a brass plate securely fastened to the frame of the machine in such a position that it shall be easily legible from the sawyer's stand. (See Discussion.)

(*c*) The upper and lower wheels of all band mills shall be guarded in accordance with the standards prescribed in section 40. (See fig. 11.)

(*d*) Every band shall be provided with a saw catcher or rest of substantial construction.

(*e*) The driving belts on band mills shall be guarded with standard guards. (See sec. 40.)

Rule 222. Circular Mill.

(*a*) There shall be a hood or guard over the upper saw of every double circular mill. (See fig. 12.)

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At mill end of log deck, protect sawyer and others from rolling logs.
A saw catcher or rest must be provided.
Levers which control log turner and carriage must admit of being locked when not in use.
Band Mills and Band Resaws must be enclosed
Feed Lever must be guarded.

Opening above band mill may be railed, as shown, but a door or other solid covering is preferred.

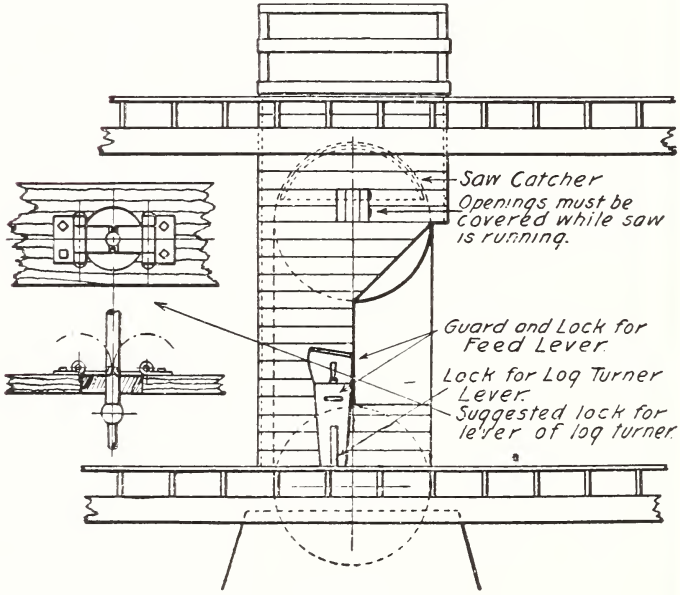

FIG. 11.—*Guards for band saws.*

(*b*) There shall be a hood or guard over the saw of every single circular sawmill. (See fig. 13.)

(*c*) On all double circular mills the horizontal distance from the side of the saw to the nearest post of the husk or

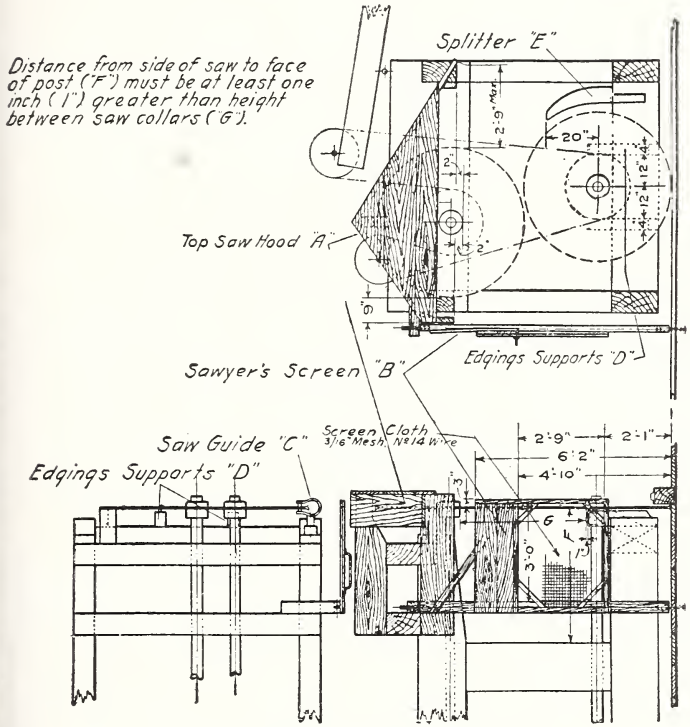

FIG. 12.—*Guards for double circular mills.*

frame shall be at least 1 inch greater than the clear vertical distance between the collars of the top and bottom saws. (See Discussion.)

(*d*) The belts and pulleys driving circular mills shall be guarded according to the standards prescribed in section 40.

(*e*) A screen of wire cloth or other suitable device shall be so placed on double circular sawmills as to protect the sawyer from flying particles.

(*f*) Circular sawmills shall be equipped with safety guides which will admit of adjustment without the use of a wrench or other hand tool.

(*g*) All circular mills shall be equipped with an effective splitter. All circular sawmills used for edging lumber shall

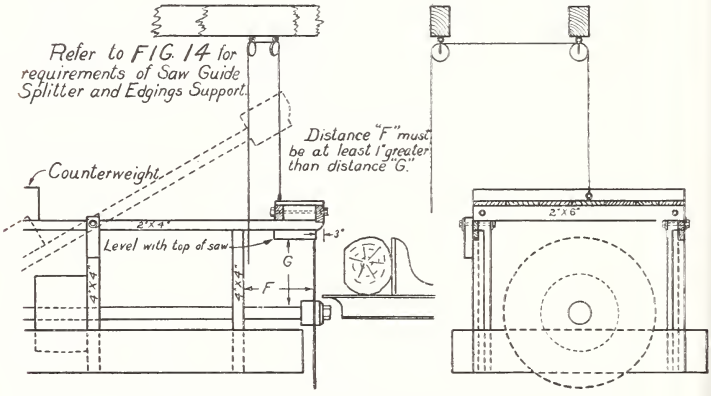

FIG. 13.—*Guards for single circular mills.*

be provided with a solid, stationary splitter which shall extend at least 20 inches above the head blocks. (See fig. 14.)

(*h*) Brackets or edging supports shall be provided between the saw and the side of the husk.

(*i*) The peripheral speed of circular head saws shall not exceed 10,000 feet per minute.

Rule 223. Rock Saw.

(*a*) Where rock saws are provided, the upper portion of the saw shall be guarded. (See Discussion.)

(*b*) Wherever practicable, the rock saw shall be provided with an exhaust hood.

Rule 224. Sawyer's Stand.

(*a*) The sawyer's stand shall be protected by a shield at least 4 feet in height, consisting of iron or steel not less

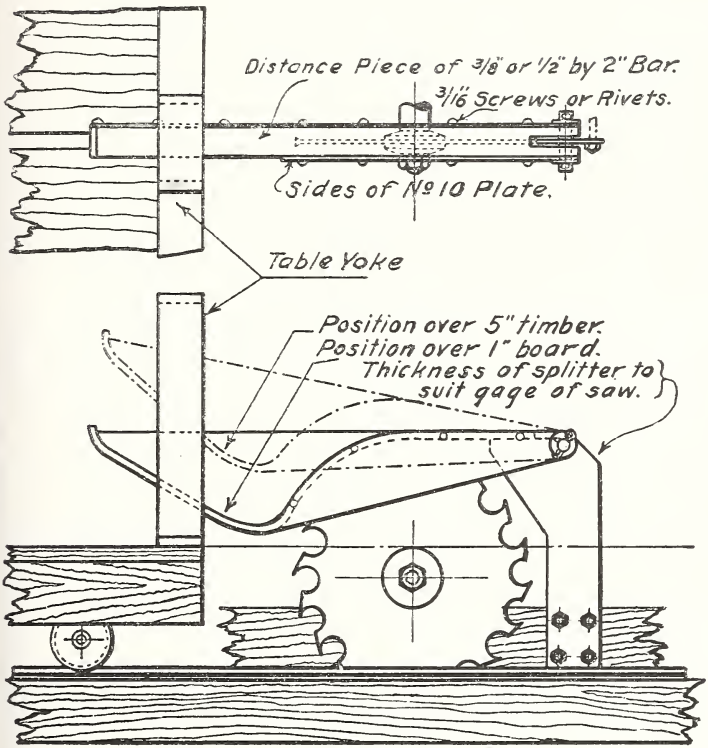

FIG. 14.—*Guard for single or bench edger.*

than one-fourth inch thick, or planks 2 inches or more in thickness, or a concrete wall 8 inches or more in thickness.

(*b*) Means shall be provided so that the sawyer may, in emergency, stop the mill without leaving his stand. A means shall be provided for locking the emergency mill

stop in the off position for the protection of men making repairs on the mill.

Rule 229. Operating Rules.

(*a*) Any band saw found to have developed a crack whose depth is one-tenth of the width of the saw or more shall be discontinued from service and discarded, unless the width is subsequently so reduced as to eliminate the crack or unless the cracked section is replaced.

(*b*) No circular mill saw shall be used when it is found to have developed a crack one-half inch or more in depth.

(*c*) No dull or improperly swaged saw shall be used.

Dull saws are very likely to cause kickbacks.

(*d*) All band-mill wheels shall be inspected at least once a month. All hubs, spokes, rims, bolts, and rivets shall be hammer tested and thoroughly examined.

(*e*) No band-mill wheel on which a crack is found on rim or spoke shall be continued in service.

Cracks can be determined by covering the surface of the wheel and spokes with oil and then wiping clean. A hammer test will cause oil to start from any existing cracks.

SEC. 23. LIVE ROLLS, EDGERS, GANG SAWS, AND RESAWS.

Rule 230. Live Rolls.

(*a*) Chains and sprockets and gears used to drive live rolls shall be entirely inclosed on top, bottom, and sides with standard guards. (See sec. 40.)

(*b*) Belts and pulleys and friction disks used to drive roll shafts, if located above the mill floor, shall be entirely inclosed according to standards prescribed in section 40.

(*c*) Driving shafts of live rolls must be entirely inclosed or guarded on top and side with standard guards.

(*d*) The space between live rolls shall be entirely filled in, either with planking 2 inches or more in thickness or with

metal sheets or plate so supported that it will not be displaced visibly by a load of 150 pounds applied at any point.

If bolts are used to fasten such planking, the heads should be set in holes countersunk in the plank.

Sheet metal should be not less than one-fourth inch in thickness.

(*e*) Spiked live rolls shall not be used except in log conveyors. (See Discussion.)

Rule 231. Edger.

(*a*) All edger-drive belts located above the mill floor shall be guarded according to standards prescribed in section 40.

(*b*) All power-driven gears, chains, and sprockets shall be guarded with standard guards. (See sec. 40.) It is recommended that hand-operated adjusting gears, unless protected by the body of the machine itself, be guarded.

(*c*) All saws shall be guarded by a housing of wire mesh not less than No. 8 U. S. gauge, or wood not less than 1½ inches in thickness, or by a screen hung between the saws and the operator. The screen shall be of 2-inch planking or of wire of not less than No. 12 U. S. gauge with a mesh that will reject a ball one-half inch in diameter.

(*d*) Unless the feed rolls are made in independent sections of not over 6 inches in length or are so hung as to form a toggle, finger guards or dog guards, as shown in Figure 15, shall be provided in addition.

(*e*) Where the first pressure (feed) roll is located within 30 inches of the front of the edger, guard bars or strips shall be provided in front of the rolls.

(*f*) Openings in the end frames of the edger shall be inclosed with wood or wire mesh, such inclosure to be hinged or other provision made to permit oiling and inspection. (See Discussion.)

(g) Bench or single saw edgers shall be equipped with splitter and saw guard. (See fig. 14.)

Rule 232. Gang Saws.

(a) The gears driving the feed rolls shall be guarded in accordance with the standards prescribed in section 40.

(b) If located within 6 feet of floor or platform, the feed-friction plates shall be inclosed.

(c) The feed-drive belt and pulley shall be inclosed with standard guards to a height of 6 feet from the floor or platform.

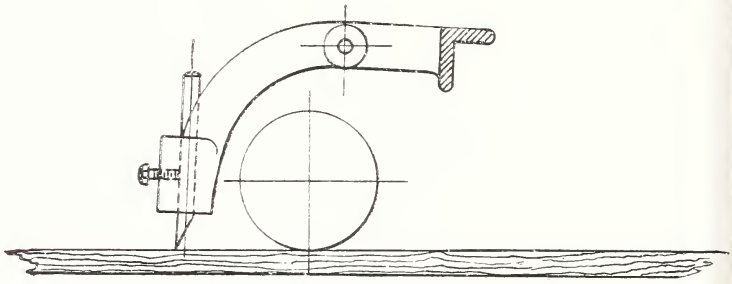

FIG. 15.—*Antikick back device for edgers.*

(d) If the operator stands within 30 inches of the feed rolls, a guard strip of metal shall be provided in front of the rolls, the guard to be attached to the roller frame.

(e) If engine-driven, the crosshead slide, crank, and connecting rod shall be inclosed with standard guards. (See Part IV.)

(f) If belt-driven, the drive belt and flywheel shall be guarded with a standard guard.

Rule 233. Resaws.

(a) Band and circular resaws shall meet the specifications of band and circular mills. (See rules 221 and 222.)

(*b*) If the operator stands within 30 inches of the feed rolls, the rolls shall be provided with guard strips fastened to the roll carriers.

Rule 239. Operating Rules.

The pressure rolls on edgers should not be lifted while stock is being run except when absolutely necessary. If it is necessary that the rolls be lifted, the operator should stand at the side of the machine. The rolls should never be blocked up; the lever should always be used.

SEC. 24. TRIMMERS, SLASHERS, AND TRANSFER TABLES.

Rule 240. Overhead Trimmer.

(*a*) Overhead-trim saws shall be guarded with a barricade of planking 2 inches or more in thickness, bolted to 4 by 4 inch posts. The barricade may be either suspended from the roof by chains or cables or may be through bolted to the frame of the machine. This guard shall be placed not more than 8 inches from the trim table. (See Discussion.)

(*b*) A barricade similar in construction to that required in rule (*a*) shall be provided in the rear of the overhead-trim saws. The guard shall be so constructed as to afford full protection to anyone working or passing in the rear of the trimmer.

(*c*) Drive belts, gears, and chains shall be guarded to a height of 6 feet from the floor with standard guards. (See sec. 40.)

(*d*) The end saws on all overhead trimmers shall be fenced off or otherwise guarded from contact.

Rule 241. Jump or Bed Trimmers.

(*a*) A substantial guard of 2-inch planking or heavy wire mesh shall be placed in front of the saws.

(*b*) The underpart of the saw table shall be inclosed with standard guards, suitable hinged doors being provided to give access to various parts for lubrication and adjustment.

(*c*) Exposed drive belts and pulleys should be inclosed according to standards prescribed in section 40.

(*d*) Where the jump saws are operated by a foot treadle or treadles, a safety block shall be provided which may be placed under the treadles while repairs or adjustments are being made

Where the saws are controlled by hand levers it is recommended that a yoke be provided that will hold locked all levers when repairs or adjustments are being made.

(*e*) An iron stirrup shall be fastened to the floor, over the treadle, leaving just sufficient room for the operator to insert his foot above the treadle.

(*f*) The end saws if exposed to contact shall be railed off or guarded according to standards laid down in section 40.

Rule 242. Swinging Cut-Off Saw.

(*a*) The drive belt of swinging cut-off saws shall be inclosed to a height of 6 feet from the floor with a standard guard. (See Part IV.)

(*b*) The upper part of the saw shall be guarded with a substantial hood of sheet iron or other standard guard.

(*c*) The counterweight shall be provided with a chain securely fastened to the ceiling or building wall and to the weight. (See Discussion.)

A bolt placed through the end of the counterweight rod can be easily added to prevent it from coming off the rod should it become loose.

(*d*) Swing cut-off saw should be equipped with adequate safety catch, so as to prevent the saw from jumping or bounding back when released by operator.

Rule 243. Slashers.

Slashers shall be guarded in the same manner as overhead-trim saws. (See rule 240.)

Rule 244. Transfer Tables.

(*a*) All spur and beveled gears driving transfer tables shall be guarded with housings of sheet metal or wood.

(*b*) The vertical face of all transfer tables shall be guarded with sheet metal, heavy mesh, or wood housing, unless so located as to be protected by live roll tables or machine frame.

SEC. 25. CONVEYORS AND WASTE DISPOSAL.

Rule 250. Conveyors.

(*a*) Belts, pulleys, clutches, and friction drives driving conveyors, if located within 6 feet of the platform or floor, shall be provided with standard guards. (See sec. 40.)

(*b*) All chains, gears, and sprockets used to drive conveyors shall be guarded with standard guards. (See sec. 40.)

(*c*) The conveyor taking material from the slasher saws shall be equipped with a clutch or a tight-and-loose pulley, and means shall be provided for operating this device from the sorter's platform.

Clutches or tight-and-loose pulleys are urgently recommended for all conveyors, except endless-belt conveyors used for sawdust.

(*d*) For chain hauls the return run of the chain in the basement shall be so supported over passageways that in the event of its breaking it can not fall on anyone beneath.

(*e*) When the return run of conveyors operates within 7 feet of the floor, there shall be provided a shallow trough of sufficient strength to carry the weight resulting from a broken chain.

(*f*) If the strands are over 7 feet from the floor, a means shall be provided to catch and support the ends of the chain in the event of a break over passageways or runways.

Rule 251. Hog Mill.

(*a*) The chute feeding the hog mill shall be inclined, or a baffle shall be provided to prevent material from being thrown from the mill.

(*b*) The hog mill-drive belt and pulley shall be guarded if located within 6 feet of the floor or platform.

Rule 252. Stove Wood Saws.

(*a*) The belt and pulley driving the saw shall be guarded with a standard guard to a height of 6 feet from the floor of platform.

(*b*) A substantial barrier of wood not less than 1½ inches in thickness, or sheet iron not less than one-eighth inch in thickness, shall be provided over the saws. This guard shall come within 6 inches of the saw table.

(*c*) Gears, shafts, chains, and sprockets driving feed mechanism shall be guarded to a height of 6 feet from the floor. (See sec. 40.)

Rule 253. Burner.

(*a*) If the burner stack is not of the cylindrical self-supporting type, it shall be stayed at not less than three different points with cables attached to permanent anchorage.

(*b*) The conveyor runway to the burner shall be equipped with a double handrail. If such runway crosses a roadway or thoroughfare, 6-inch toe boards shall be provided in addtion.

(*c*) The burner should be equipped with a spark arrestor or other appliance to prevent the escape of sparks to inflammable substances around the mill and yards or to the woods.

SEC. 26. MISCELLANEOUS MACHINERY.

Rule 260. Lath Bolters.

(*a*) The gears and sprockets of lath bolters shall be fully guarded with standard guards, and the feed chains shall be guarded to as low a point as the maximum height of the stock will permit.

(*b*) Drive belts and pulleys located above the mill floor shall be guarded to a height of 6 feet from the floor with standard guards.

(*c*) A hood of iron not less than three-sixteenths of an inch in thickness shall be provided over the saws of the lath bolter, hood to be hinged so it can be turned back to permit changing of saws.

Rule 261. Lath Mills.

(*a*) The feed rolls, saws, gears, sprockets, and chains of lath machines shall be guarded with standard guards and a device installed to prevent "kick backs."

(*b*) Drive belts and pulleys located above the mill floor shall be guarded to a height of 6 feet from floor or platform with standard guards. (See Part IV.)

(*c*) A hood of iron not less than three-sixteenths inch in thickness shall be provided over the saws of the lath mill, hood to be hinged to permit of turning back while changing saws.

Rule 262. Lath Bundle Trimmers.

(*a*) The saws of the lath trimmer shall be guarded on ends, top, and rear with a substantial housing of wood or metal.

(*b*) The belt drive of the lath trimmer shall be guarded to a height of 6 feet from the floor with a standard guard. (See sec. 40.)

Rule 263. Shingle Mills.

(*a*) The front or cutting face of knife-type shingle jointers shall be fully guarded, with the exception of a narrow slot through which the shingles may be fed against knives.

(*b*) The saw used in shingle mills shall be guarded with a hardwood or heavy metal strip, and where practicable all of the saw except the operating edge shall be guarded.

(*c*) Shingle bolts for vertical shingle mills shall be piled not more than two high.

(*d*) Shingle clip saws should be entirely housed with sheet metal or a substantial wood casing except for the operating edge. The drive belts of shingle mills should be inclosed in a standard guard to the height of 6 feet from the floor.

Rule 264. Heavy Bolter.

All heavy bolters shall be equipped with a stationary splitter, and the saw shall be guarded on the top with a hardwood or metal strip. Where the bolter is equipped with a short-travel carriage, the bolter shall meet the requirements for the circular mill. (See rules 220 and 222.)

Rule 265. Rossers.

(*a*) The rotating heads on rossers shall be entirely inclosed except for the operating face.

(*b*) A suspended guard of expanded metal or wire mesh that will reject a ball one-fourth inch in diameter shall be hung in front of each rosser head.

Rule 266. Green Planer.

(*a*) Planer heads shall be entirely inclosed with standard guards. (See Part IV.)

(*b*) Drive belts and pulleys on planers shall be provided with standard guards to a height of 6 feet from the floor. (See sec. 40.)

Rule 267. Dip Tanks.

Drive belts, chains, and sprockets on dip tanks shall be provided with standard guards. (See sec. 40.)

Rule 268. Saw-Filing Machinery.

(*a*) Guards shall be placed over the belts which drive the emery wheels on saw-grinding machines where these belts pass through the head frame.

(*b*) All grinding wheels 8 inches or more in diameter shall be provided with a substantial wrought iron or steel retain-

ing hood which shall cover the arbor ends if otherwise exposed.

(*c*) All filing-room employees shall be provided with suitable goggles for use when operating emery wheels.

Rule 269. Operating Rules.

(*a*) Employees operating lath mills or bolters shall be cautioned to push the end of a piece of stock through the saws with another piece of stock, not with their hands.

(*b*) Employees shall be warned against lifting the feed rolls of lath mills or bolters when they themselves or anyone else are in line with the saws.

SEC. 27. POWER.

Rule 270. Boilers.

(*a*) Boilers shall comply with existing State rules and regulations or the requirements of the Boiler Code of the American Society of Mechanical Engineers.

(*b*) Factors of safety shall be obtained by using the formula given in the Boiler Code of the American Society of Mechanical Engineers and shall be not less than 4.5.

(*c*) There shall be at least two independent means of supplying water to power boilers.

(*d*) Each boiler shall have at least one water glass, the lowest visible part of which shall be not less than 2 inches above the lowest permissible water level. (2) Water-gauge glasses shall be fully protected by substantial guards which will prevent the flying of broken glass.

(*e*) Each boiler shall be provided with a spring-loaded safety valve of sufficient capacity to discharge all of the steam generated without allowing the pressure to rise more than 6 per cent above the allowable working pressure (Boiler Code of the American Society of Mechanical Engineers).

(*f*) Each boiler shall have three or more gauge cocks (try cocks) located within the range of the visible length of the water glass.

(*g*) (1) Each boiler shall have a steam gauge connected to the steam space. The gauge shall be connected to an inverted siphon or equivalent device of sufficient capacity to keep the gauge tube filled with water and so arranged that the gauge can not be shut off from the boilers except by a cock placed near the gauge and provided with a T or lever handle arranged to be parallel to the pipe in which it is located when the cock is open. (2) The dial of gauges shall be graduated to not less than one and one-half the maximum allowable working pressure of the boiler.

(*h*) During the season when forest fires are liable to occur, boiler smokestacks shall be equipped with efficient spark arresters unless oil is used for fuel.

Rule 271. Engines.

(*a*) Engine flywheels shall be guarded with a standard guard or a standard handrail. (See sec. 40.)

(*b*) The engine crank shall be housed with sheet metal or wire mesh or expanded metal that will reject a ball one-half inch in diameter.

(*c*) All engines with a flywheel over 36 inches in diameter shall be provided with a governor and a governor-stop device that will shut off the steam should the governor driving mechanism fail.

(*d*) Governor fly balls if located within 6 feet of floor or platform shall be guarded with a housing of sheet metal or wire mesh.

(*e*) Where engines run condensing it is desirable to have a vacuum breaker to facilitate prompt stopping. This can be done by having the vacuum break automatically when the engine stop is operated.

Rule 272. Auxiliaries.

(*a*) Chains, sprockets, shafting, etc., on mechanical stokers shall be provided with standard guards. (See sec. 40.)

(*b*) Rotating or reciprocating parts of pumps shall be protected with standard guards.

(*c*) Flywheel-type air compressors shall meet the requirements for steam engines. (See rule 271.)

Rule 273. Electrical Equipment.

Motors, switches, and wiring shall be installed in accordance with the requirements of the National Electrical Safety Code (Handbook No. 3, U. S. Bureau of Standards) and the National Electrical (Fire) Code.

Rule 274. Water Wheels and Turbines.

(*a*) The spur or bevel gears attached to wheels or turbines shall be entirely housed with standard gear guards (See sec. 40.)

(*b*) Water turbines shall be equipped with governors that will permit a speed variation of not more than 10 per cent from full load to no load.

Rule 279. Operating Rules.

(*a*) The fireman upon going on duty in the boiler room shall ascertain the height of water in the boiler.

(*b*) If the water is so low as to not be visible in the glass, the fires should be covered with ashes or fresh coal and drafts closed, or fire should be pulled. Do not turn on the feed water or open the safety valve until boiler cools down.

(*c*) In case of foaming, the throttle should be closed and kept closed long enough to determine the true level of the water.

(*d*) Safety valves shall be tried out daily.

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(*e*) The boiler should be blown down one gauge every morning or at the end of each shift.

(*f*) Boilers should be scaled every two weeks or oftener, if the feed water is hard, to prevent burning or bagging of the boiler due to the accumulation of scale on the plates.

(*g*) The water column shall be blown down twice a day.

(*h*) The main engine should never be started until the engineer is sure that the mill machinery is clear. A gong signal from the mill floor or a signal blown on the steam whistle is desirable.

SEC. 28. POWER TRANSMISSION.

See Code for Mechanical Power-Transmission Apparatus. Copies may be obtained from the United States Bureau of Labor Statistics, Washington, D. C.

Part III. YARD OPERATIONS.

SEC. 30. DRY KILNS.

Rule 300. Kiln Design and Layout.

(*a*) A walkway of open or lattice construction (not to impede circulation) shall be provided on at least one side or in the center of end-piling kilns and on two sides of cross-piling kilns. Walkways may be omitted from kilns open at one end only. This walkway may be made of iron pipes (1 inch diameter or over) resting on steel crossbeams, or of perforated or expanded metal (at least 50 per cent open). Two by four inch timbers on edge, spaced 2 inches apart, can be used if necessary; metal of equivalent strength is preferred.

(*b*) Grades that permit loaded cars to attain a momentum of 150 feet per minute shall be prohibited, and in no case shall the grade exceed 15 inches in 100 vertical feet.

(*c*) All doors shall be provided with a method of fastening them open while kiln is being loaded. Vertical lifting doors will not be permitted unless all counterweight ropes are of fire-resisting material and counterweights are boxed or guided.

(*d*) Where operating pits are provided, they shall be ventilated, drained, and lighted, and not less than 6 feet in depth and 3 feet in width. All valves, dampers, damper rods, traps, and other operating devices should be located in the operating pit. The roof of this pit, including ventilating openings and manholes, shall be of such a type of construction as to prevent injury to operator and shall be provided with gratings, doors, and guards. It shall not

be necessary to enter kiln proper for any operating regulation.

(*e*) All high-pressure steam mains located in or adjacent to this pit shall be covered with asbestos or other heat-insulating material.

(*f*) When kiln doors are protected by roof or building used for loading, unloading, or storage, suitable ventilating windows or other openings should be provided immediately above doors to allow escape of steam and moisture.

Rule 301. Clearances.

The tracks in kilns shall be so located as to afford a clearance of at least 18 inches between a loaded car and the wall of the kiln. (See Discussion.)

Rule 302. Exits.

All double-end kilns shall be provided with at least one exit door at each end. This door shall be easily opened from the inside of the kiln and shall be not less than 5 feet 6 inches in height. (See Discussion.)

Rule 303. Ladders.

A permanent ladder attached rigidly to the kiln wall at the rear or side shall be provided to permit easy and safe access to the roof. (See Discussion.)

Rule 304. Mechanical Equipment.

All belts, pulleys, blowers, etc., used in or about kilns shall be guarded with standard guards. (See Part IV.)

Rule 309. Operating Rules.

(*a*) Kiln operators should keep a stock of stop blocks (2 by 4 inches, 1 foot longer than rail spacing) for chocks at convenient points near kiln entrance and exit doors.

Smaller blocks are to be discouraged because of danger to hands in placing them and tendency to cramp trucks on rails if one side is stopped first.

(*b*) In cold weather kiln tenders should stay in a warm room for at least 10 minutes after leaving a hot kiln before working in the open.

Kiln operators should be provided with a small heated office for the location of testing instruments, record blanks, telephone, etc.

(*c*) If openings between cars of lumber standing on the kiln track are used as thoroughfares, the cars on the upgrade should be well chocked.

(*d*) Operators should be warned against inhaling air of kiln when kiln is in operation.

(*e*) If open doors are disengaged from carriers and hangers, care should be taken to block them up to prevent falling over.

SEC. 31. YARD.

Rule 310. Railroad Tracks.

(*a*) In new construction a clearance of 7 feet shall be maintained between the center line of all broad-gauge tracks and any building, post, pole, or other permanent structure.

(*b*) In existing installations, where a clearance of 7 feet does not exist between the center line of broad-gauge tracks and buildings or other permanent structures, a warning sign should be displayed.

(*c*) All frogs, switches, and crossovers on broad-gauge tracks located within the mill yard shall be provided with filler blocks of hardwood or metal.

(*d*) In existing installations, where overhead clearance is less than 22 feet, telltale ropes shall be provided 20 feet in each direction from the overhead structure, these telltale ropes to be spaced not more than 6 inches apart and to extend to a point at least 1 foot below the lowest point of the overhead structure for which they are to serve as a warning.

Rule 311. Roads and Walkways.

(*a*) Where tramways cross above roads or thoroughfares they shall be provided with a solid substantial fencing to a height of at least 42 inches or a distance equal to the width of the roadway or thoroughfare.

(*b*) In new construction an overhead clearance of 22 feet shall be maintained over all roadways.

(*c*) Where the clearance above roads or thoroughfares is less than 22 feet telltales meeting the requirements of rule 310 (*d*) shall be installed.

(*d*) For the clearance required for high-tension electric lines see National Electrical Safety Code, Handbook No. 3, U. S. Bureau of Standards.

Rule 312. Tramways.

(*a*) All tramways shall be designed to show a factor of safety of not less than 10 based on the assumed loading of a fully loaded lumber dolly, load to be figured at 2½ tons per thousand board feet.

(*b*) Except for such sections as are used for piling lumber all tramways located 6 feet or more above the ground shall be provided with a handrail of standard construction. (See sec. 21.)

(*c*) All tramway tracks should have switches, frogs, and crossings protected with fill-in blocks of hardwood or metal.

Rule 313. Tractors.

(*a*) All gears, exposed flywheels, and other dangerous moving parts shall be provided with standard guards.

(*b*) Tractors driven by gasoline engines shall be provided with some form of safety exhaust so as to prevent hot sparks from being thrown from the exhaust pipe.

(*c*) Tractors running on tramways 6 feet or more above the ground shall be limited, either in the design of the machine itself or by the introduction of a throttle governor to a speed of 12 miles per hour.

Rule 314. Mechanical Stackers.

Drive belts, pulleys, gears, etc., if located within 6 feet of the floor or platform, shall be provided with standard guards. (See sec. 40.)

Rule 315. Lumber Docks.

(*a*) Live rolls on lumber docks shall meet requirements of live rolls located within the mill. (See rule 130.)

(*b*) Where timbers are discharged from the rolls onto inclined skids, a warning gong should be provided for the use of dock operators.

Rule 316. Lumber Stacks.

(*a*) Lumber stacks shall be built up on solid and substantial bottoms; foundations shall be large enough to carry the pile without sinking appreciably into the ground.

Rule 317. Tanks.

(*a*) The supports of all elevated tanks shall be accessible for the purpose of inspection.

(*b*) Every tank over 7 feet deep shall have a fixed ladder both inside and out. Rungs shall have a clearance of at least 6 inches.

Rule 319. Operating Rules.

(*a*) Tramways shall be thoroughly inspected every month, and all rotten or broken planks replaced at once.

(*b*) Switchmen shall be warned against riding on the top or sides of cars when there is insufficient clearance between cars and buildings.

(*c*) Switchmen shall be warned, in boarding the running board of a locomotive, not to stand between the rails, but to stand to one side of the track.

(*d*) Switchmen shall open automatic couplings before cars come together.

(*e*) Switchmen shall not ride in the gangway of an engine between the cab and the tender or on the footboard between the engine and cars that are being pushed.

(*f*) Mill employees shall be warned against passing between cars temporarily uncoupled and standing close together.

(*g*) Signals for moving trains should not be given until the conductor or switchman is certain that everything is clear.

(*h*) Switches which are provided with locks should always be kept locked when not being used.

(*i*) Cars should not be switched or placed on tracks protected by "DANGER" targets.

(*j*) Switchmen should never go between cars to cut them when opening lever or chain is disconnected. The lever on adjoining car should be used, and the defective car separated and reported to yard office at once.

(*k*) Switchmen should never reach over the drawing bars to turn angle cock when coupling up air.

(*l*) Switchmen should never go between or under cars to make "emergency repairs" until after notifying the engineer and having engine cut off and moved away from train, as well as having trainmen to protect the other end of train.

(*m*) When cars are left standing on a grade, brakes shall always be set and wheels of cars blocked.

(*n*) Switchmen should never ride on side cars after nightfall until they are thoroughly familiar with the yard.

(*o*) It is recommended that lumber stackers always face toward the side of the stack when within 3 feet of side.

(*p*) When stacking lumber in windy weather, the stacker should always keep the edge of the board turned toward the wind.

SEC. 32. LUMBER-HANDLING MACHINERY.

Rule 320. Factors of Safety and Construction.

(*a*) Proper provisions for strength shall be made for parts subject to impact and rough usage. Journals and shafts shall be of sufficient size to bring the pressure within safe limits.

(*b*) All apparatus shall hereafter be designed throughout with not less than the following structural factors of safety, under static full-rated load stresses, based on the ultimate strength of the material used: All gears and complete hoisting mechanism, 8; all other parts, 5.

(*c*) Calculations for wind pressure on outside cranes shall be based on not less than 30 pounds per square foot of exposed surface.

(*d*) Cranes should be of what is known as "All Steel Construction"; no cast iron should be used except for such parts as drums, bearings, brackets, etc. Cast iron shall not be used for trolley and truck housings subject to tensile or compressive stress. No combustible material should be used.

(*e*) All bolts should be of the through type and be equipped with approved lock nuts or lock washers.

(*f*) The cages of cranes hereafter erected shall be of fire-resisting construction.

Rule 321. Machine Guards.

(*a*) Where access to the crane is necessary, steps or stairs with handrails should be used.

(*b*) Platforms having stairways leading to them should be provided for changing and repairing truck wheels on end trucks.

(*c*) A platform or footwalk, accessible from one or more fixed ladders or stairways and not less than 20 inches in width, shall be provided to give access to the crane.

(*d*) A footwalk shall be placed along the entire length of the bridge on the motor side, except when the construction of the crane prevents or when such a platform would not ordinarily be used for the repair or maintenance of the crane. This walk should be at least 6 feet 6 inches below the bottom of the overhead trusses.

(*e*) Footwalks should be placed across the ends of the trolleys at right angles to the bridge walks. When so placed, they shall be not less than 12 inches in width.

(*f*) Footwalks shall be of substantial construction and rigidly braced.

(*g*) No openings shall be permitted between the bridge footwalks and the crane girder. When wire mesh is used to cover such openings, the mesh opening must not be greater than one-half inch.

(*h*) Each footwalk shall have a standard metal railing and toe guard at all exposed edges wherever practicable.

(*i*) Not less than 12 inches actual clearance should be allowed between highest point of a crane and the overhead trusses and not less than 2 inches between any part of the crane and building, column, or other stationary structure. Where there are more than two crane runways in parallel, there should be a clearance of not less than 24 inches between the extremities of the cranes.

Rule 322. Limit Stops.

(*a*) A hoist-limiting device should be provided for each hoist.

(*b*) Limit switches shall be provided at each end of the runway.

(*c*) Crane bumpers shall be provided and shall be at least one-half of the diameter of the truck wheel in height. Both truck-wheel and trolley bumpers should be fastened to the girder and not to the rails. Bumpers shall be built up of plates and angles or be made of cast steel.

Rule 323. Electrical Equipment.

(*a*) The installation of the switchboard, wiring, and all electrical equipment shall fully comply with the National Electrical Safety Code of the U. S. Bureau of Standards (Handbook No. 3) and the fire-prevention regulations of the National Board of Fire Underwriters. (See rule 273.)

(*b*) There shall be a main-line switch or its equivalent so arranged as to cut off all power from the crane and so constructed that it may be locked in its open position. Convenient and lockable means should be provided on the floor for cutting the power from any part of the crane structure.

(*c*) Open-type controllers shall have an asbestos-lined steel guard over the movable contact parts, both to protect the operator's eyes and to prevent articles from falling on contact parts.

Rule 324. Slings, Ropes, Cables, and Chains.

(*a*) Ropes, chains, and cables used for slings shall show the following factors of safety:

Cable	6
Chain	8
Manila rope	10

(*b*) All slings shall have permanently attached to them a small brass tag stamped with the following information: (1) Safe capacity in pounds for vertically suspended loads. (2) Date when sling was placed in service.

(*c*) Timber-handling cradles shall be of sound, straight-grained timber and shall show a factor of safety of 8 based on usual load hauled. Stresses shall be based on allowable stress for the variety of wood used as given in tables by the Forest Products Laboratory.

(*d*) Fastenings for hoisting chains or cables shall be made on the underside of such cradle, and all through bolts shall be secured by lock nuts or cotter pins.

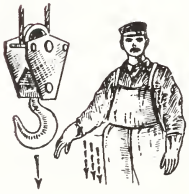
Rule 325. Signals.

The signals shown in Figure 16 shall be the standard crane signals.

HOIST — Make small horizontal circles with the hand, holding the forearm in a vertical position and forefinger extended

RACK — Jerk hand in direction of racking, with arm extended, hand just above hip, fingers closed, thumb extended horizontally

STOP — Hold position rigid, with arm extended and hand level with the hip



LOWER — Wave forearm downward with arm extended, hand below the hip and palm downward

TRAVEL — With forearm vertical and hand open with palm in direction of travel, wave forearm in direction of travel

EMERGENCY STOP — Move hand quickly to right and left with arm extended, hand level with the hip

FIG. 16.—*Manual signals for crane operations.*

Rule 329. Operating Rules.

(*a*) Cranes shall be operated only by regular crane operators, authorized substitutes who have had at least two weeks' experience and training under the supervision of a competent operator, crane repairmen, or inspector; no one else should enter a crane cage.

(*b*) The operator shall familiarize himself fully with all crane rules and with the crane mechanism and its proper care. If adjustments and repairs are necessary, he shall report the facts at once to the proper authority.

(*c*) Cranes shall be examined daily for loose parts or defects.

(*d*) Cranes shall be kept clean.

(*e*) Whenever the operator finds the main or emergency switch open, he shall not close it, even when starting on regular duty, until he has made sure that no one is on or about the crane, and he shall not oil or repair the crane unless the main switch is locked open.

(*f*) Before closing the main switch the operator shall make sure that all controllers are in "OFF" position.

(*g*) If the power goes off, the operator shall immediately throw all controllers to "OFF" position until the power is again available.

(*h*) When leaving the cage, the operator shall throw all controllers to "OFF" position and open the main switch.

(*i*) The operator should not reverse a motor until it has come to a full stop, except to avoid accidents.

(*j*) The operator shall recognize signals only from the one man who is supervising the lift. Operating signals should follow an approved standard; they should be manual, never verbal. Whistle signals may be used where one crane only is in operation. Before starting to hoist, the operator shall place the trolley directly over the load to avoid swinging it when being hoisted. This precaution is especially important.

(*k*) Bumping into runway stops or other cranes shall be avoided. When the operator is ordered to engage with or push with other cranes, he shall do so with special care for the safety of persons and cranes.

(*l*) If the crane is located out of doors, the operator shall also lock the crane in a secure position to prevent it from being blown off or along the track by a severe wind.

(*m*) No person shall be permitted to operate a crane who can not speak and read the English language or who is under 18 years of age.

(*n*) No person shall be permitted to operate a crane whose hearing or eyesight is defective or who is suffering from heart disease or other ailments that might suddenly incapacitate him. A physical examination is required at least once each year.

Part IV. GUARDS.

SEC. 40. STANDARD GUARDS AND RAILINGS.

See Safety Code for Mechanical Power-Transmission Apparatus.

Copies may be obtained from the United States Bureau of Labor Statistics, Washington, D. C.

DISCUSSION OF THE RULES.

SEC. 10. FELLING.

Rule 100. Axes, Etc.

(*a*) Many of the accidents occurring in the woods are due to broken handles or to use of handles of improper sizes for the particular operator or for the purpose for which they are used. The following specifications for long and short hickory handles have been prepared by the Forest Service and are recommended for use:

Material.—To be thoroughly seasoned, straight-grained, white, red, or mixed hickory, excluding light-weight wood (minimum weight to be above 37.5 pounds per cubic foot of solid dry wood) and to show not more than 20 rings of annual growth per inch.

All handles to be free of defects,[3] except that in one-third of the consignment or less, defects will be allowed of any of three types, as follows (see fig. 17):

1. In long handles one ¼-inch sound knot located within 4 inches from the tip of the eye or within a distance from the head of not more than one-fourth of the length of the handle. In short handles one ¼-inch sound knot located within a distance from the head of not more than one-third the length of the handle, or

2. Small sound knots or bird pecks not bunched and together not exceeding the area of a ¼-inch knot, located within 4 inches of the tip of the eye or within a distance from the head of not more than one-fourth of the length of the handle in long handles or one-third of the length from the head in short handles, or

[3] Defects in hickory include checks, knots, bird pecks, wormholes, brashness, incipient decay, rot, dote, cross grain, and dip grain.

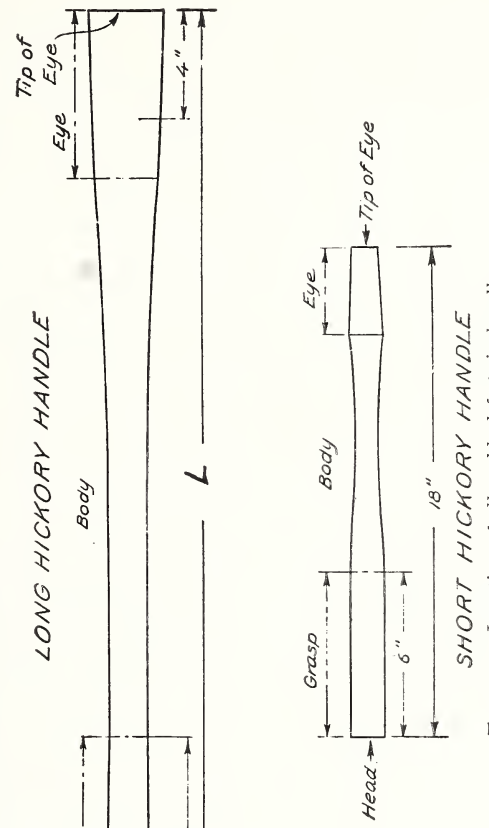


FIG. 17.—*Location of allowable defects in handles.*

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3. Threadlike iron streaks not to exceed four in number for long handles and two in number for short handles running the entire length of the handle, or their equivalent length in shorter streaks.

Size.—Handles to be straight and true to form and within the range of dimensions called for, allowing one-sixteenth inch variation in thickness and width and one-half inch in length.

Finish.—All handles to be double-belt sand finished and waxed.

(*c*) A number of serious accidents have been attributed to the lack of suitable wedges. This applies particularly when "bucking up" trees in the forest.

Rule 101. Springboards.

The use of springboards is exceedingly common, particularly in the West and South, where it is necessary to get above the root swelling to make the felling out. In some cases the men are working as high as 12 feet above the ground. Unfortunately, many makeshift springboards are pressed into service, sometimes resulting in serious injury to the chopper. The same remarks hold true of chopping platforms which are used rather extensively in some Western operations, particularly when felling redwood.

Rule 109. Operating Rules.

(*d*) The buckers and swampers should be kept at a reasonable distance from the fellers, as they are much more liable to be struck by a falling tree than the men actually felling it, as they are devoting nearly all of their attention to the cutting up of the log on which they are working.

(*e*) Loose limbs or dead bark constitute a hazard similar to falling trees. In some of the United States national forests operating companies are required to fell the dead timber as they come to it. Unfortunately, this is not done

on many privately owned sections, and such timber may form a menace to the men working in the vicinity.

(*g*) The V-groove notch worked out by the Southern Pine Association will eliminate the danger of kick backs, and it is advocated wherever the nature of the trees felled will permit. The method of making the fall by this method is about as follows: In place of making the usual horizontal ax cut on the side toward which the tree is to fall, two inclined ax-cuts are made, these meeting at the bottom to form a deep V. The saw cut is started on the opposite side and several inches above the bottom of the V. When the cut has progressed to the point where the tree starts to fall, the wood in back of the V splits down, leaving a projection of the trunk resting in the V. This effectively prevents kick backs and at the same time gives more sound lumber from the butt log. (See fig. 18.)

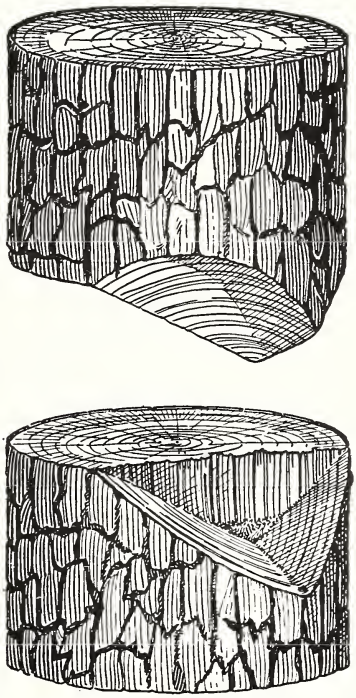

FIG. 18.—*V-notch method of felling timber. It prevents kick backs of the butt.*

(*l*) Every year there are a considerable number of loggers trapped by forest fires and burnt to death. Some of these fires are probably due to the carelessness of the loggers themselves. (See fig. 19.)

SEC. 11. CONVEYING, SKIDDING, YARDING, AND ROADING.

Rule 110. Cables.

Owing to the weight of loads handled and the danger of logs being hung up on stones, stumps, or other objects the question of factor of safety of cables is of considerable importance. The reason that the factor of safety was based on the stalling load of the engine was because of the ease of computing such load. Where the bore, stroke, and working pressure of a logging engine are known, it is a comparatively simple operation to compute the maximum pull of a drum of known diameter with a given gear ratio to the engine. The loads handled, on the other hand, are at best difficult to estimate, and a factor of safety based on the usual load would give a far less definite result than one based on the stalling power of the engine. It may be of interest to note the source of the value adopted. This is the figure used by one of the largest manufacturers of logging engines in the country. Another large manufacturer uses a factor of safety of 5 based on average load, but estimates that this would be in practical agreement with a factor of safety of 3 based on the stalling load. The reason for the exception of cables over 1⅛ inches is that on the Pacific Slope extremely large and powerful engines are used. If no limit were set in this rule, it would require cables of such size and weight as to be unmanageable in the woods. A 1⅛-inch cable is about as large as can be successfully handled on the average logging "chance."

Rule 111. Sheaves and Fastenings.

(*a*) The importance of having sheaves of sufficient strength has not in many cases received the attention it deserves. Where multiplying blocks are used, the load on the sheave pin and on the fastenings of such sheaves is not the tension in the cable, but is several times that, depending, of course,

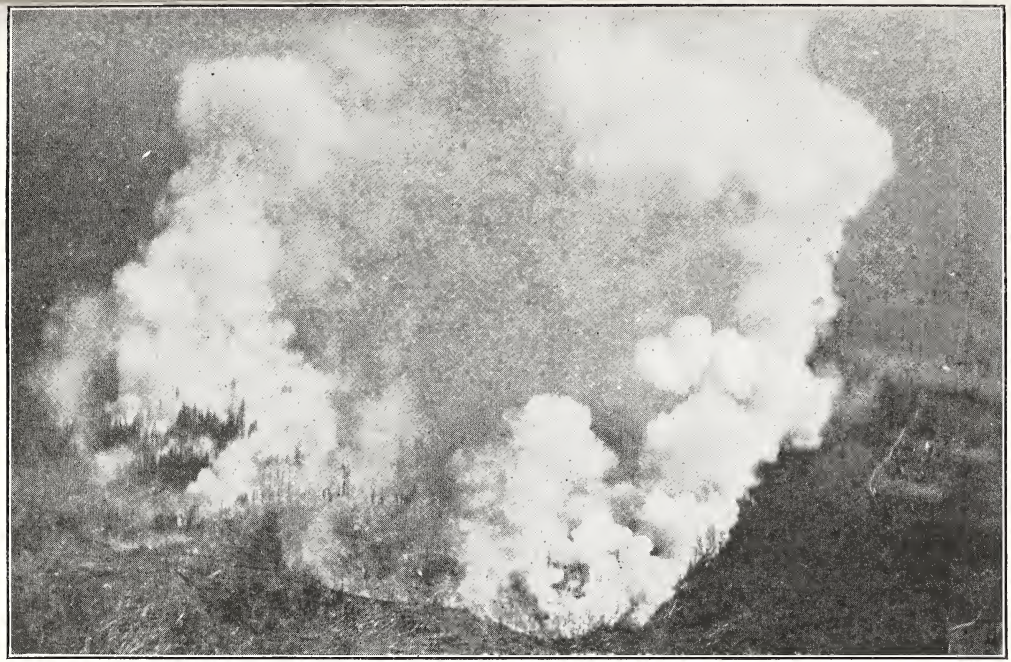

FIG. 19.—*Airplane view of a forest fire.*

Such fires are responsible for many deaths each year. (Rules 109, 135, etc.)

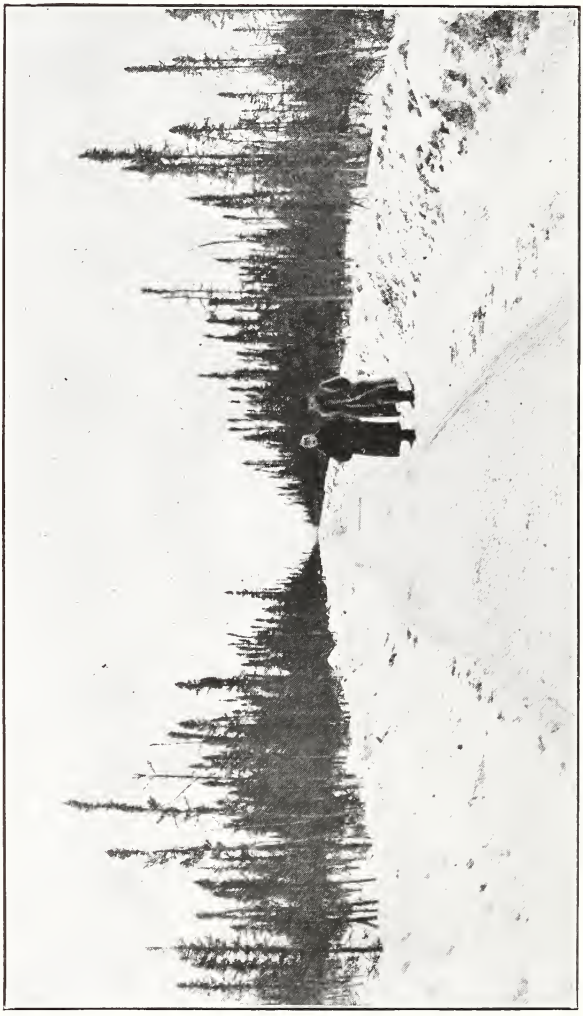

FIG. 20.—*Ice road.*

Note protecting earth banks on either side. (Rule 116.)

upon the number of blocks in the sheave. Many serious woods accidents have been attributed to the failure of such pins or fastenings.

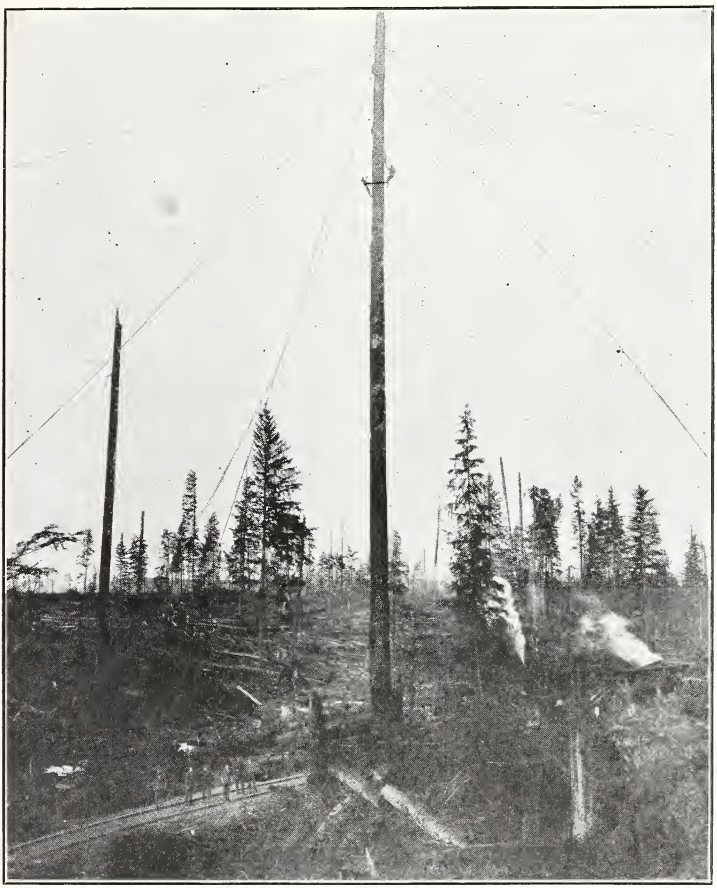

FIG. 21.—*Use of safety belt while climbing head spire tree.* (*Rule 119.*)

Rule 119. Operating Rules.

(*h*) Projecting limbs on saw logs are a rather fruitful source of accident, not only while the logs are being hauled to the landing but also while they are being transported on logging railroads. Switchmen are frequently struck by such projections, and such accidents have on occasions resulted fatally.

SEC. 12. LOADING.

Rule 123. Cables.

(*b*) In the case of loaders, as in the case of cranes and derricks, in general, hooks which are entirely too light for the work intended are frequently encountered. Such hooks may bend or straighten enough to drop the load.

Rule 129. Operating Rules.

(*h*) Where end hooks are used on large and heavy logs, there is danger of their tearing out and dropping the log, hence the recommendation for the use of straps or chokers. (See fig. 22.)

SEC. 13. DONKEY BOILERS AND ENGINES.

Rule 135. Fire Prevention.

The same remarks hold here as mentioned under rule 109 (*l*).

SEC. 14. LOGGING RAILROADS (TRACK AND ROADBED).

Rule 140. Weight of Rails.

The diagram given shows the minimum weights of rails to be used if a reasonably safe track is to be provided. Where the road is to be used for any considerable period of time, heavier rails than those indicated are desirable.

Rule 149. Operating Rules.

(*a*) The question of maintenance of railroad equipment is vitally connected with the safe operation of trains. These

inspections should be made by experienced men, and wherever dangerous conditions are found they should be remedied immediately. In many cases, where particularly bad conditions have been found, it would be advisable to prohibit the use of that section of track until the repairs have been carried out. A delay caused by such repairs will in nearly every case take far less time and be less expensive than clearing up a bad wreck. (See figs. 24 and 25.)

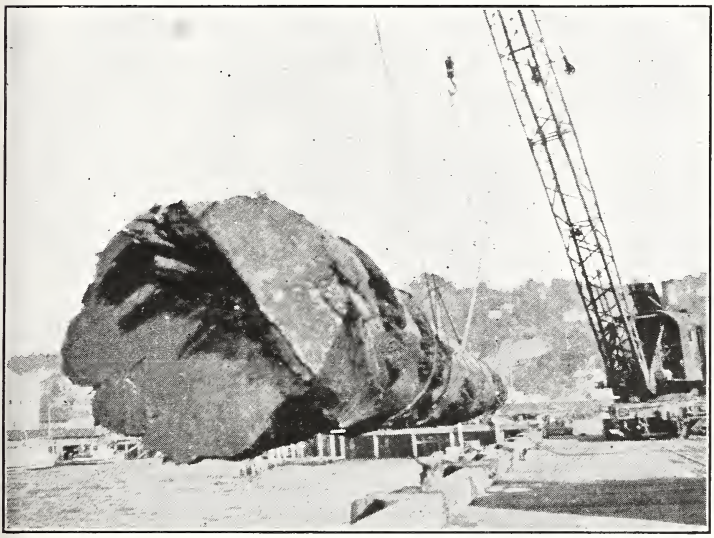

FIG. 22.—*Use of slings for lifting heavy logs.* (*Rule 129.*)

SEC. 15. LOGGING RAILROADS (ROLLING STOCK).

Rule 154. Lamps.

The emergency equipment required in the last sentence of this rule is added because of the importance of having light, particularly on the boiler gauges. In case of failure of electrical system from any cause, it should be possible to provide adequate illumination at short notice.

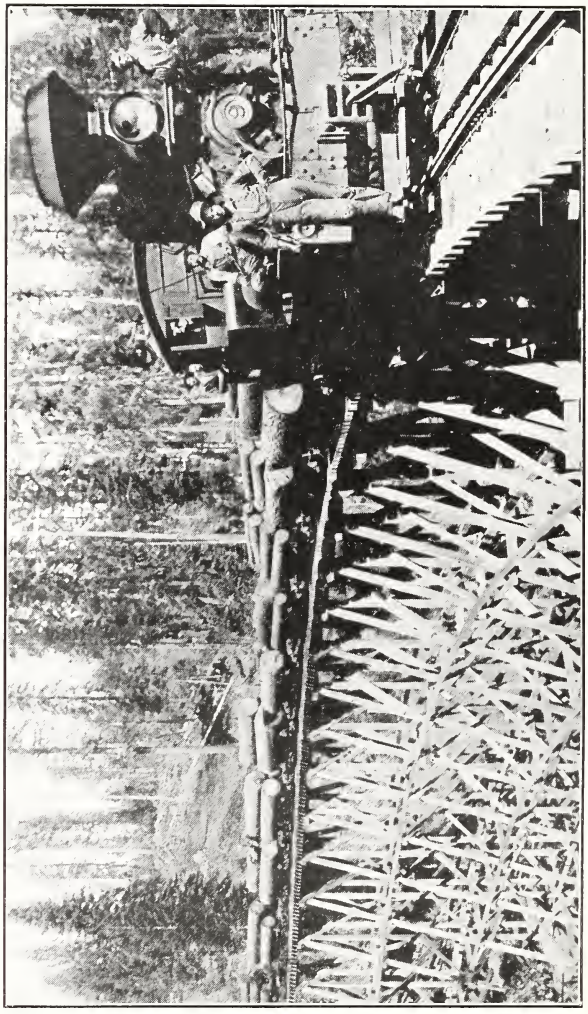

FIG. 23.—*Showing use of guard rail on curved trestle.* (*Rule 144.*)

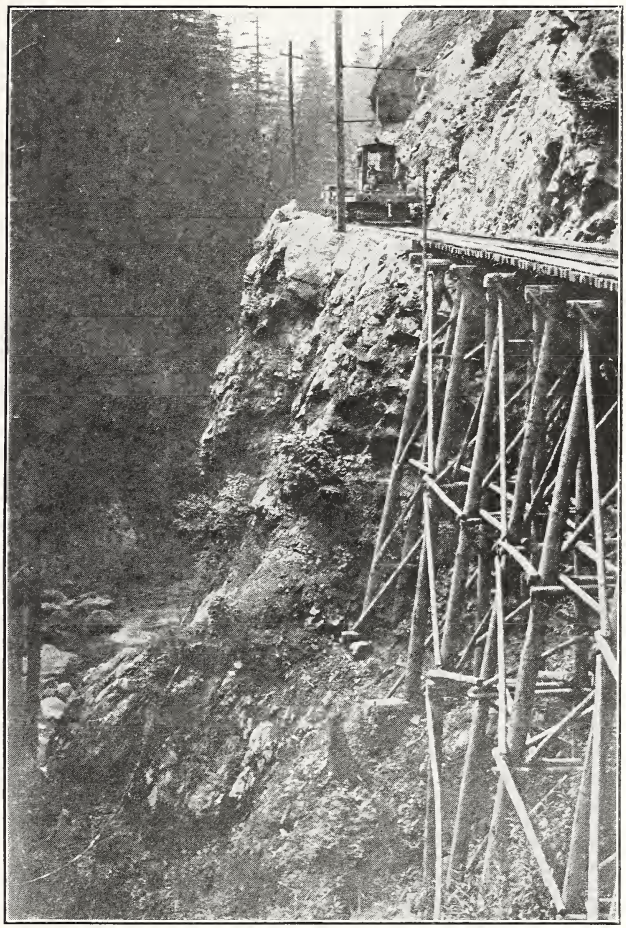

FIG. 24.—*Typical trestle in mountainous country.*

Proper inspection of bents and footings is of particular importance in such locations. (Rule 149.)

FIG. 25.—*Condition of trestle footing found by inspection.* (*Rule 149.*)

Rule 155. Safety Equipment.

(*d*) (*e*) The reason for these requirements is the danger of forest fires, which take a considerable toll of human life each year.

Rule 157. Car Equipment.

(*d*) The brake wrenches frequently used are of such soft stock and such dimensions that they deform enough to

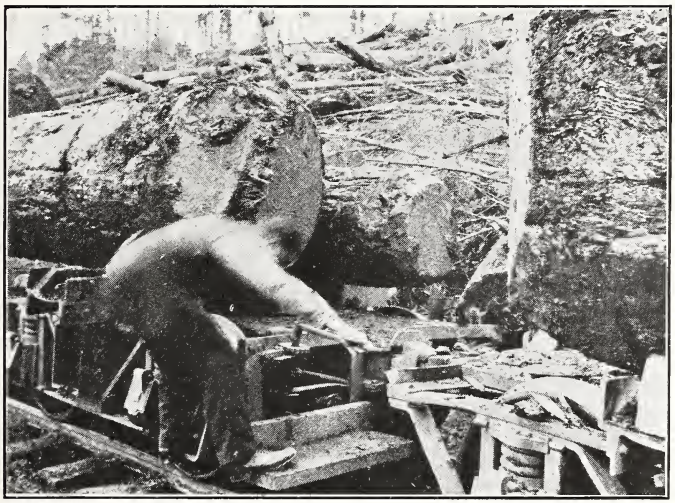

FIG. 26.—*Step and stirrup for brakemen.* (*Rule 157.*)

allow the brakemen to fall from the car. A number of fatal accidents have been traced to this cause.

(*e*) The practice of hooking an empty flat car between the locomotive tender and the log cars is rather common in some of the mountainous districts in the East. It is advisable where high loads are handled, as a sudden stop may throw part of the load of logs on the tender when another flat car is not interposed.

SEC. 16. RULES GOVERNING TRAIN OPERATION.

Rule 160. Fixed and Published Rules.

The requirement in this rule that all trains engaged in the transportation of logs and lumber shall be governed by fixed and printed rules is in accord with the usual railroad regulations and is designed to prevent the establishment of signals or methods of operation by members of an individual train crew. While such a crew may be able to operate

FIG. 27.—*Use of adjustable log bunks; chains used only as an added precaution.* (*Rule 157.*)

their particular train safely, a change in the personnel of the crew may lead to a misunderstanding which will result in a serious wreck. As crews and equipment are frequently interchanged on various sections of a logging road, it is desirable that rules be uniform, and definite printed instructions are undoubtedly the best way of securing such uniformity.

Rule 161. Crew.

This rule requires two men on the locomotive and is intended to prevent collisions or derailments due to sudden illness or other incapacity of the engine driver. In such cases a fireman could shut off steam and stop the train.

Rule 162. Signal Lights.

This rule is in accord with generally accepted practice on most railroads. The desirability of uniform signals is, of

FIG. 28.—*Rock ledge in river showing remains of log jam.*

Such obstructions can generally be removed at a small cost during the season of low water. (Rule 170.)

course, obvious. The same holds true of the standard hand, flag, and lamp signals as in the case of the rule above.

Rule 164. Whistle Code.

This is offered in the cause of standardization. In view of the relatively high labor turnover in such work the desirability of having uniform signals is at once apparent.

SEC. 17. RIVER DRIVING, RAFTING, AND FLUMING.

Rule 170. Preparation of a Channel.

River driving is undoubtedly one of the most dangerous phases of logging work. Probably the most hazardous operation in river driving is the breaking up of log jams. The proper preparation of the channel will do much to eliminate such jams and will require less actual work on the logs in the river than is the case where the stream is

FIG. 29.—*A typical log jam.* (*Rule 170.*)

left in its natural condition. Frequently bowlders and rock ledges will damage a considerable amount of timber in the drive. In such cases the increase in the number of sound logs delivered to the mill will more than pay for the cost of improving the channel. Likewise, the cost of clearing up the banks of the river after the drive will be considerably less and there will be a smaller number of lost logs. (See figs. 28, 29, and 30.)

Rule 172. Rafting.

A study of the accident statistics of States in which considerable lumbering is carried on will generally disclose a number of drowning cases. Within the last two years several such drownings have been reported in New England and in the Northwest. Life preservers might often prevent such drowning accidents.

Rule 179. Operating Rules.

(*c*) In breaking down woods decks it frequently happens that men working on the lower part of the deck will be caught and crushed when a number of logs start rolling off simultaneously. Where the stream is narrow and the opposite bank is of suitable character, such woods decks may be quickly broken down by the aid of a grabhook attached to a rope operated from the other bank. This rope may be pulled by man power or by a team of horses. This method is used considerably in breaking down woods decks in Canada and has proved very satisfactory. It is, of course, much safer than breaking down with peavies on the woods bank itself. (See figs. 32 and 33.)

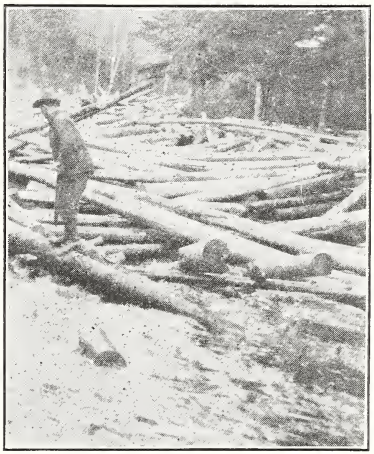

FIG. 30.—*Breaking up a log jam; a very hazardous occupation.*

Many jams could be avoided by a little work on the channel during low water. (Rule 170.)

Rule 179. Operating Rules.

(*f*) Within the last two years there have been at least two cases reported of men caught by an explosion of dyna-

mite while blowing a jam owing to too short a fuse. Another highly dangerous practice is that of lighting a short length of fuse attached to a stick or a bundle of sticks of dynamite and tossing them into the jam. Such practices should be forbidden under any circumstances. Where it is impossible for a man to reach the key log in the jam by walking across the logs, a charge of dynamite may be placed in the desired position by means of a light rope handled from both sides of the river. Such a charge, when in place, may be fired

FIG. 31.—*Rafting logs.*

Where this work is done over deep water life rings should be provided on the rafting forms. (Rule 172.)

electrically. If the river is too wide to make this feasible, it is sometimes possible to float a charge of explosives down into the jam on a small raft, firing electrically when the charge is in the most favorable position.

SEC. 18. USE, STORAGE, AND TRANSPORTATION OF EXPLOSIVES AND INFLAMMABLE LIQUIDS.

Rule 180. Storage.

(*a*) This rule is very frequently violated in log camps, it being a rather common occurrence to store explosives in

buildings used as bunk houses or general store. The danger of such practice is, of course, obvious.

(*d*) The requirement for bullet-proof magazines is particularly important where the logging operations are carried on, as they very frequently are, in the country in which big game is found. A few years ago a large amount of dynamite was exploded by a stray bullet in a camp in

FIG. 32.—*Breaking down woods deck.*

This can sometimes be done to advantage by means of a rope or cable from the opposite bank.

northern Michigan. The distances given on the chart are those given in the American Table of Distances, which was worked out by the Institute of Makers of Explosives.

Rule 181. Thawing.

(*a*) Where small amounts of explosives (not over two or three boxes) are used, they may be kept from freezing, except where the temperature is very low, by storing them in a box surrounded and covered by manure from the stables.

Rule 184. Transportation of Inflammable Liquids.

These rules are in accord with the usual regulations for the transportation of such liquids and are included because, with the increasing use of internal-combustion engines in logging operations, the hazard due to the use of inflammable liquids has become relatively high, and in two instances within the past three years a number of men have been burned to death while transporting gasoline on a log tow-

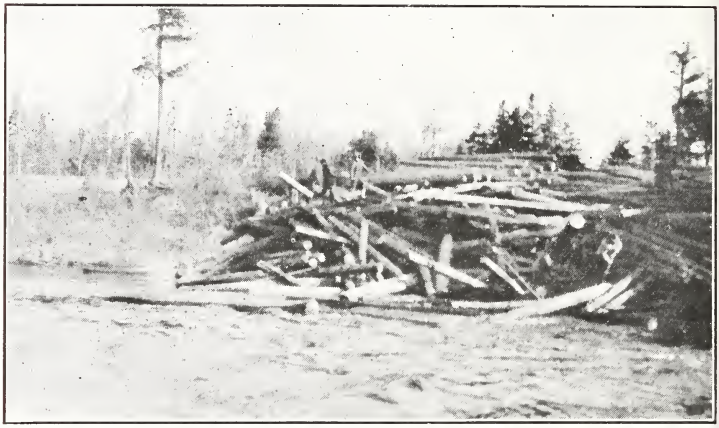

FIG. 33.—*Woods deck "jack-strawed" by the ice.*

Such irregular decks are particularly hazardous to break down.

boat, raft, or barge. One such accident in Maine a few years ago cost the lives of 17 men.

Rule 189. Operating Rules.

(*a*) All nitroglycerin explosives (dynamites) deteriorate with age. This rate of deterioration is dependent upon conditions of temperature and moisture in the storage place. It is therefore important that the oldest stock be used in every case.

(*b*) Any box of explosives showing stains on the wood or on the sawdust in which the sticks are packed should be at once removed from the magazine, as this is an indication that nitroglycerin has leaked from the cartridges. Likewise cartridges which show any liquid or gummy material on the outside should not be used. Such materials should be moved a safe distance from the inhabited building and burned on a bedding of straw or other light material. Sticks should be carefully removed from the box and spread out before the material is lighted. Guards should be posted to prevent anyone coming near while such material is being destroyed.

(*c*) A large number of fatal explosions have resulted from attempts to work with frozen or partially frozen dynamite. An attempt on the part of the blaster to soften frozen explosives by rolling between the palms of the hands is particularly dangerous and should be absolutely forbidden.

SEC. 20. MILL DESIGN AND LAYOUT.

Rule 200. General Building Specifications.

(*a*) Many sawmills are built with no computation as to the safe load which they will carry. During the past year not less than three cases of collapses of sawmill buildings have been reported. The average mill is built to cut a certain stand of timber. The life of the mill may vary from 4 or 5 years to as high as 35 or 40 years. It is generally the mill which is built to cut a relatively small amount of timber and which is designed for only a few years of life that gives the most trouble from building collapse. Frequently such semipermanent mills are used much longer than the term of years originally planned. Frequently additional stands of timber are acquired in the vicinity, and a mill which was built very hastily and with no regard for building strength is required to handle increasing loads of logs while

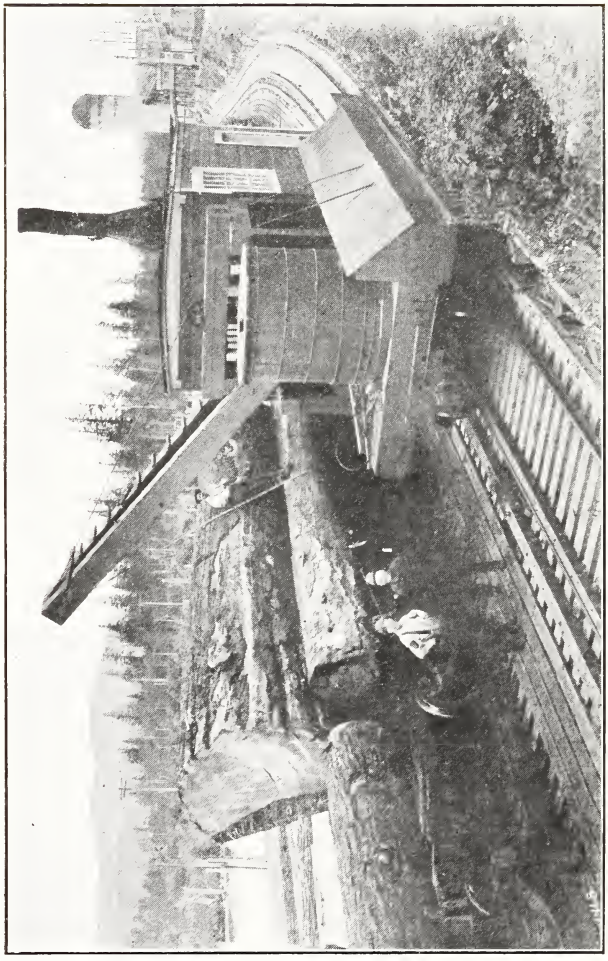

FIG. 34.—*Power unloader.*

Such devices not only eliminate a very serious hazard, but do the work more quickly. (Rule 210.)

the building is rapidly deteriorating. Entirely aside from the safety consideration, a substantial construction will do much to eliminate vibration, which in turn will mean better sawing and a higher grade of product.

Rule 201. Machine Layout and Clearances.

(*a*) In many mills the machines are crowded together in an attempt to save floor space. Such mills limit the output

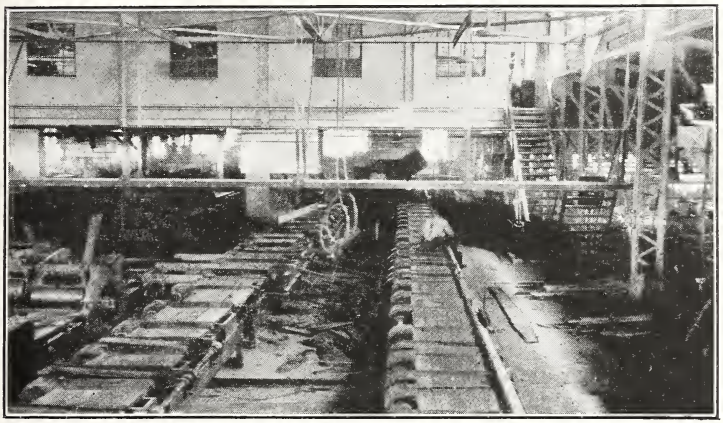

FIG. 35.—*A good mill layout.*

Ample working spaces, good natural light, and raised walkway over the live rolls. (Rule 204.)

of material per saw because of the trouble and delay in getting material to the machine. Such mills are particularly liable to accidents, as it is almost impossible for men working under such conditions to keep clear of material being handled. (See figs. 35, 43, and 44.)

(*b*) In many mills it is impossible to go from one end of the mill to the other without crawling over live rolls, slashers, conveying tables, or transfer tables. Such needless exposure of employees to operating hazards is the cause of many accidents. Where the layout of the mill is such that it is

impossible to obtain a clear walk way, an overhead runway is very desirable. (See fig. 35.)

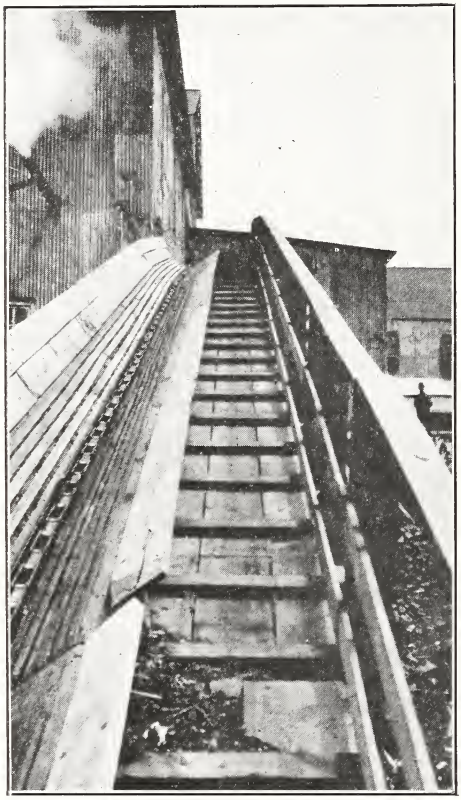

FIG. 36.—*A well-built log jack and runway.*

Note double handrail and toe board. Projecting corner of log trough should be beveled. (Rule 212.)

Rule 204. Lighting.

Many mills have inadequate illumination, particularly during the winter months. The accident statistics compiled

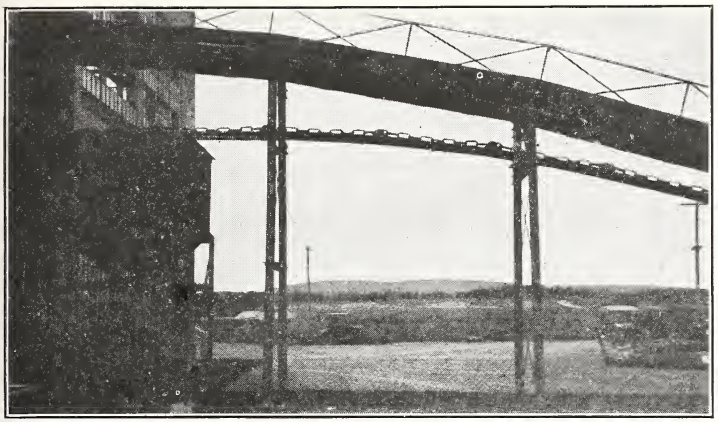

FIG. 37.—*Guarded return strand of conveyor outside of the mill.* (*Rule 232.*)

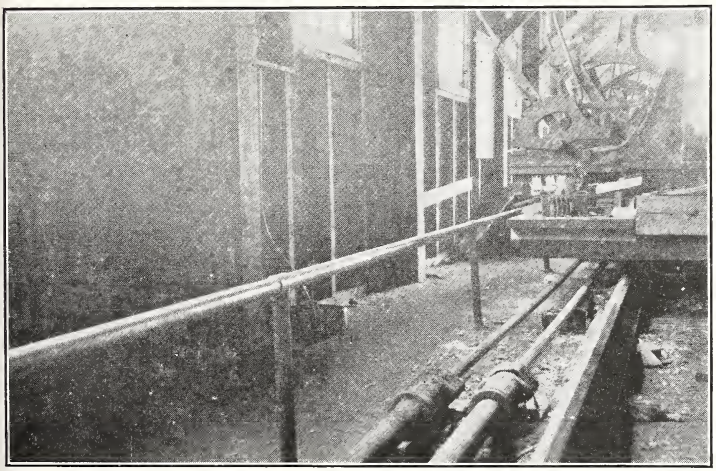

FIG. 38.—*Guard rail for carriage runway level with carriage platform.* (*Rule 220.*)

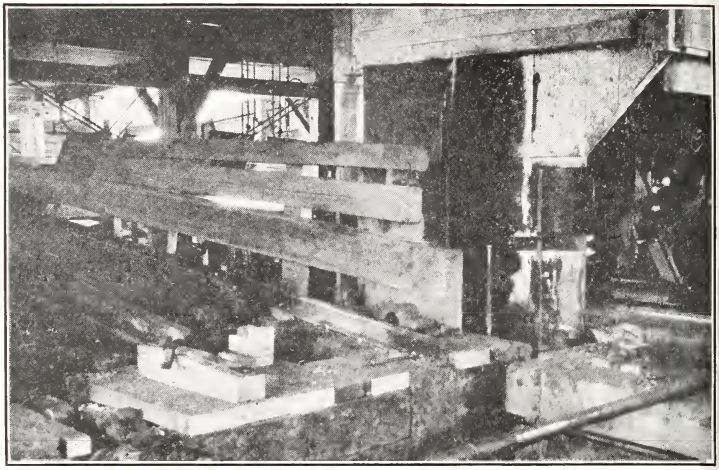

FIG. 39.—*Timber barricade at end of log deck to prevent logs rolling on sawyer.*

Note substantial construction. (Rule 224.)

FIG. 40.—*Guard for saw carriage lever.* (*Rule 224.*)

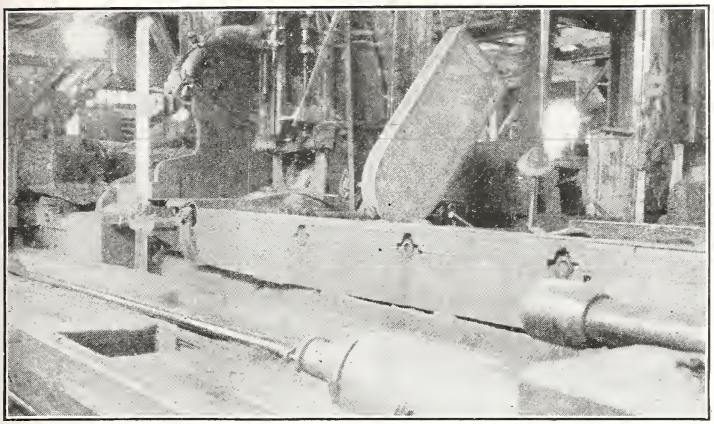

FIG. 41.—*A well-guarded band mill.*

This shows inclosed wheel, guarding of chain and sprocket, and barricade on both sides and in front of sawyer. (Rule 224.)

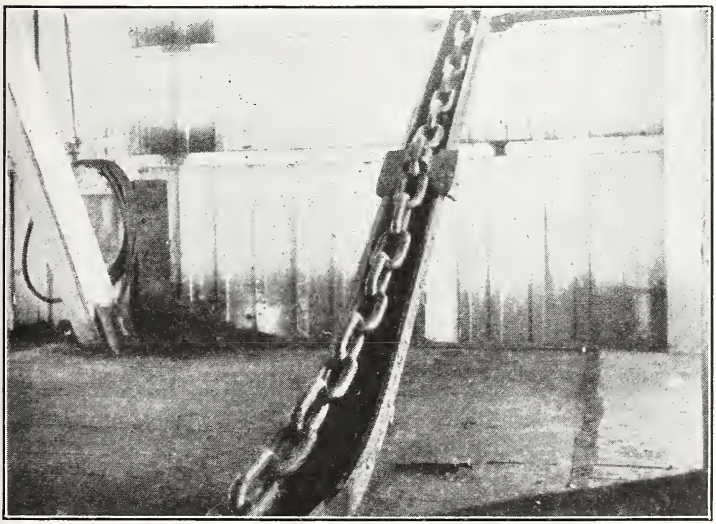

FIG. 42.—*Guarded return strand of log conveyor in basement.* (*Rule 212*)

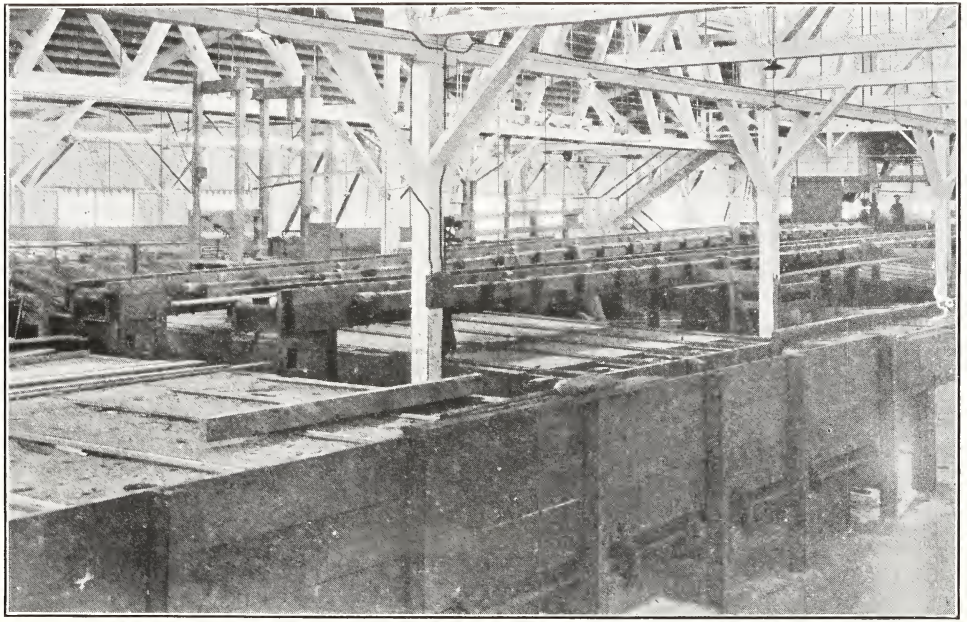

FIG. 43.—*A well-guarded mill.*

This shows inclosed live-roll drive shafts, guards on live-roll drive gears, and guards in front of sprockets on transfer tables. Observe exceptionally even distribution of natural light. (Rules 230–244.)

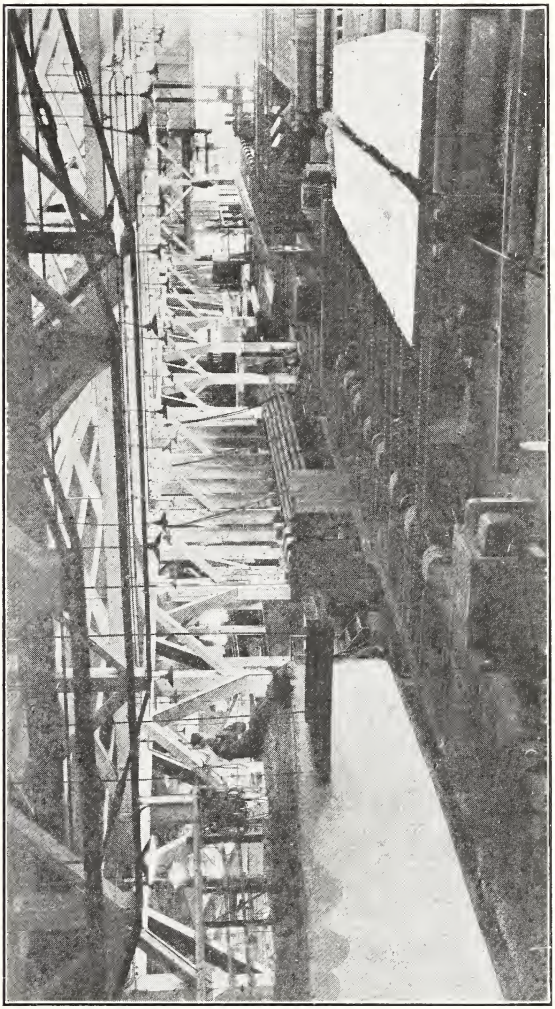

FIG. 44.—*Another well laid out mill.*

Note guards on live-roll drive shaft.

by some of the large insurance companies indicate that in about 25 per cent of the accidents reported insufficient illumination was the primary or a contributing cause. Needless to say, the quality of product cut in a well-lighted mill is better than cut in a mill where the careful examination of the log on the carriage is not possible. (See fig. 35.)

Rule 206. Ladders.

This rule should not be misinterpreted. If read carefully, it will be noted that (*a*) provides that every isolated overhead bearing for which a runway is not provided shall be reached by a fixed ladder or other safe means. This does not include line shafting which is easily accessible. The case covered in (*a*) is that of a single bearing or number of bearings, such as might be used in connection with a waste conveyor or a log jack; (*b*) provides that portable ladders shall be provided with metal hooks. Such ladders are used for oiling line-shaft bearings where the ladder may be hooked over the shaft.

SEC. 21. ROUGH LOG HANDLING.

Rule 210. Dumping.

(*a*) The largest single classification of accidents in the logging industry is the handling of logs. Many otherwise model mills have given but scant attention to this particular phase of the work. In so far as possible the unloading crew should be kept from between the car and the log dump or pond.

(*b*) The use of elevated skids will tend to prevent, to a large extent, accidents occurring in the unloading of logs. If a man is caught by logs rolling from the car, there will be room for him to drop between the skids while the logs roll over him. Power unloaders are far more safe, will unload a train of cars more quickly, and will require fewer men to

operate than the old-fashioned log deck. They are extensively used on the West coast. (See fig. 34.) In many of the Eastern and Southern mills their introduction would not only serve to speed up the operation, but would enable the cars to be unloaded with less than half of the present crew and would practically eliminate accidents from this source.

Rule 211. Log Pond.

(*a*) In looking over statistics of sawmill accidents accidental drownings are occasionally encountered. In some cases at least these are due to men being thrown into the pond by the caving in of the bank. It is particularly important in cold climates where a steam jet is used to warm the hot pond. Sometimes the steam or hot water will thaw a section of bank and cause it to cave in.

(*b*) A number of serious and fatal accidents about log ponds have been due to the breaking of pike poles while the men are working with the logs. This is particularly likely to happen when a log is being pried into position. On some occasions the men falling forward on the splinter end of such poles have received fatal wounds. In almost every case the failure of the pole has been due to cross grain. Hickory or ash saplings give satisfactory service, because even though they break they give a characteristic green-stick fracture and do not break off entirely.

Rule 213. Log Cut-Off Saws.

(*b*) It frequently happens that large circular cut-off saws, mounted on counterbalanced cradles, are located at the top of the log jack immediately inside of the building line, in some cases in such a position that they would strike a person entering a door. The door in such cases should either be barricaded, or a bar or gate attached to the saw frame should be installed and arranged so that it would shut off the passageway as the saw descends.

SEC. 22. SAWING MACHINERY.

Rule 220. Carriage (Log Carriage, Saw Carriage, Feed Carriage).

(*a*) The requirement for decking over the carriage is inserted because of the possibility of the men working on the carriage stepping through the opening in the frame and being seriously injured. Several such accidents are on record.

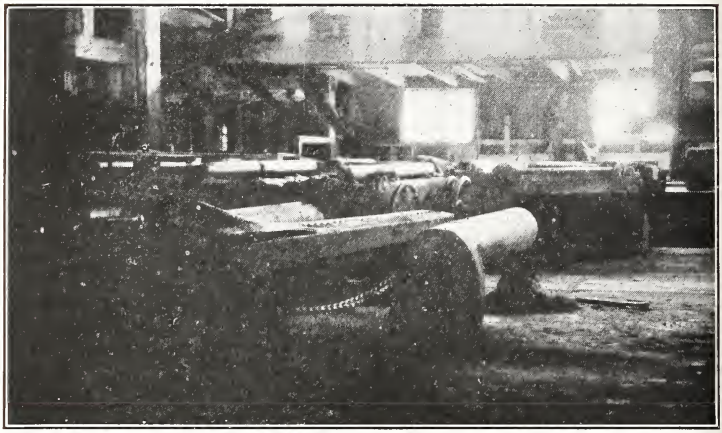

FIG. 45.—*Inclosed sprocket and chain drive for live roll (rule 230); and guards in front and in back of slasher. (Rules 230, 243, and 244.)*

(*c*) From time to time accidents are reported where repair men are struck and injured by the carriage owing to the accidental moving of the sawyer's control lever.

Item (2) is to provide an emergency shut-off for engines used to drive carriages. It sometimes happens that through the failure of a regular control lever it is impossible to shut off the engine unless such an emergency stop is provided.

(*f*) This is to prevent the nigger throwing logs over the knees and on to the setters and doggers. Sometimes the

sawyer misjudges the weight of the log or the log is partially hollow and weighs considerably less than it would weigh if sound. In such cases logs are sometimes thrown entirely over the knees and on the men working on the carriage. Entirely aside from their value in preventing accidents, such extension bars or goosenecks save a considerable amount of time which would be lost if a large log were thrown across the carriage.

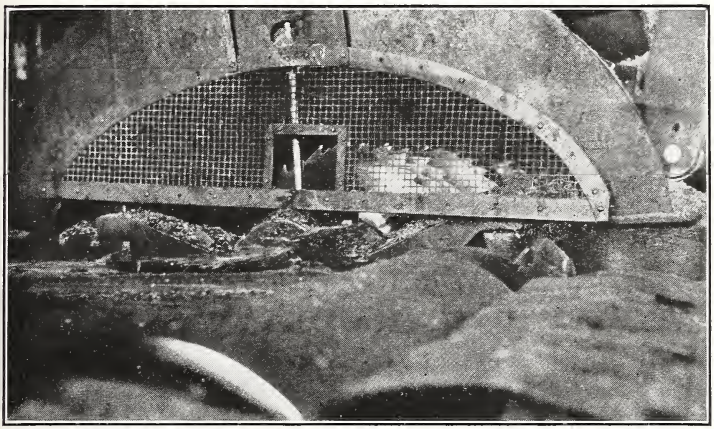

FIG. 46.—*End guard for edger; opening for oiling provided.* (*Rule 231.*)

(*i*) These requirements are to afford sufficient clearance between the wall or rough timbers and the carriage so as to eliminate danger of accident.

(*j*) This guardrail is made substandard in height so as to allow men working on the carriage a chance to step off the rear of the carriage in case of the log being thrown over or a break in the driving or control mechanism. If a 42-inch rail were installed, carriage men might be trapped

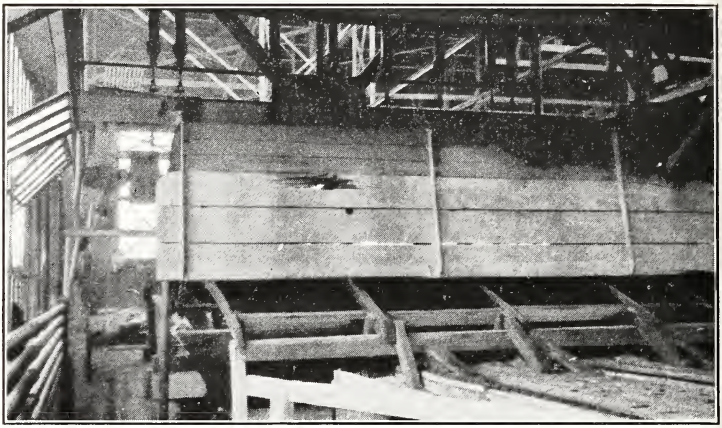

FIG. 47.—*Trimmer guard.*

Rear view showing damage to 2-inch planks caused by flying lumber. (Rule 240.)

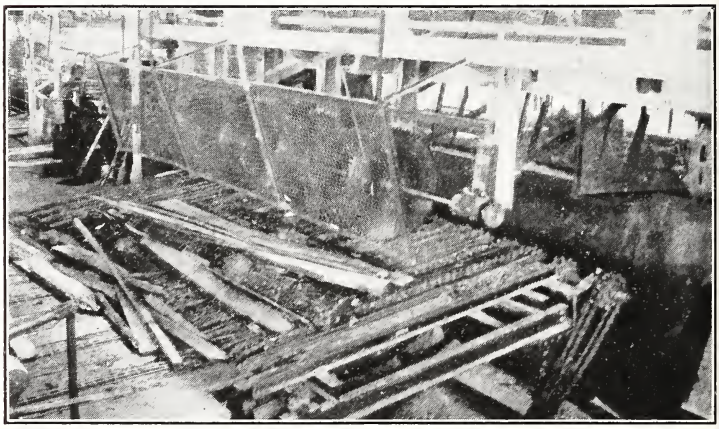

FIG. 48.—*Substantial front and rear guards for slasher saws.*

Chain and sprocket driving feed should be inclosed.

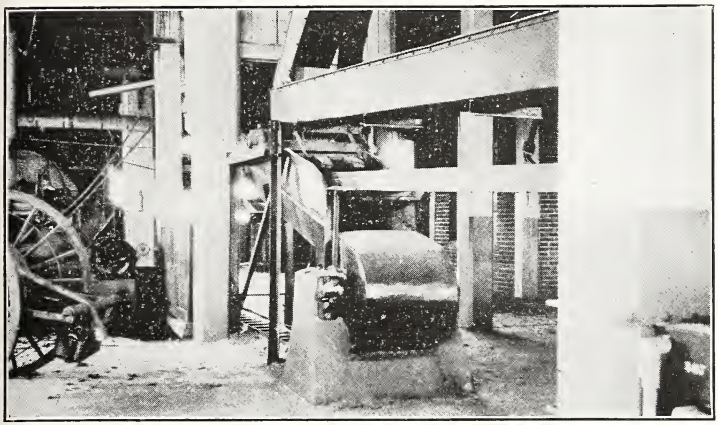

FIG. 49.—*Guarded conveyor showing hood over sprockets and trough for return strands.* (*Rule 250.*)

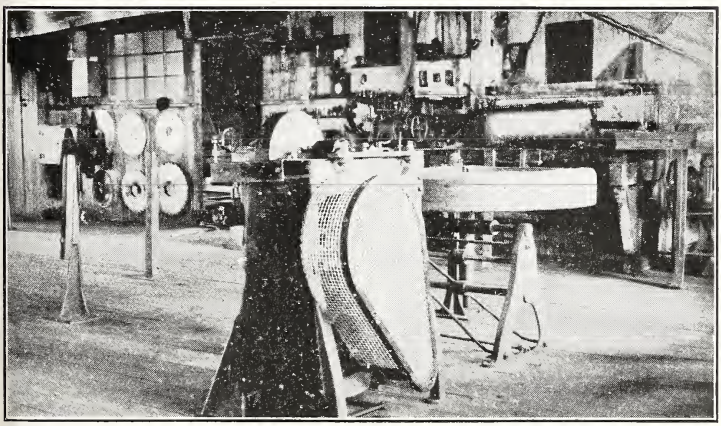

FIG. 50.—*Surface grinder with guard for sliding frame and substantial belt guard.*

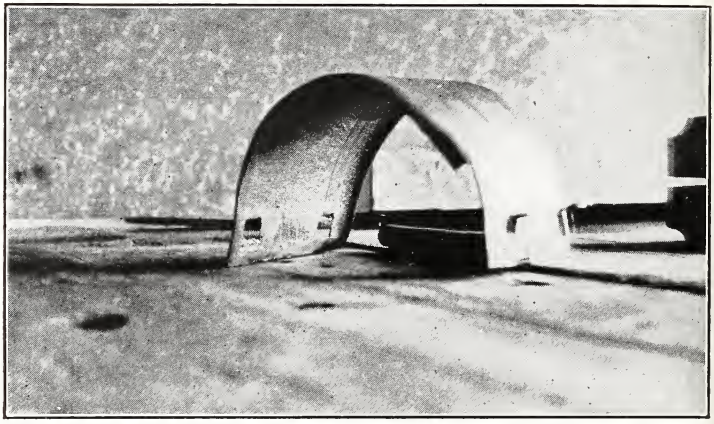

FIG. 51.—*A "quick detachable" belt guard for surface grinding machine.*

Lugs on guard engage in slots on the machine.

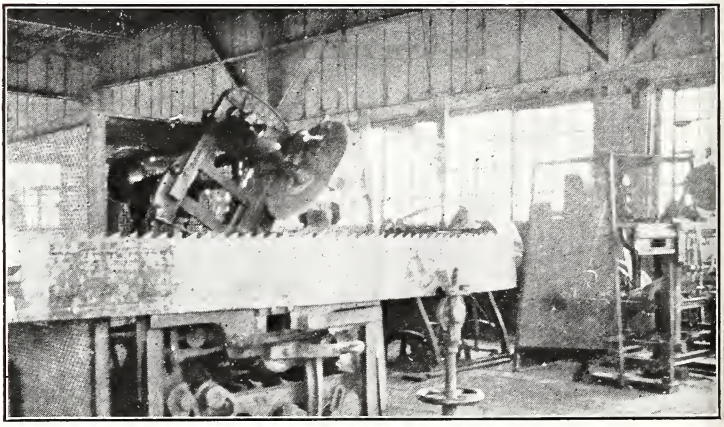

FIG. 52.—*Guards for band saw grinder; front view.* (*Rule 268.*)

on the carriage in such an emergency. (See fig. 38, showing such a guardrail.)

(*k*) These wheel guards are to serve a double purpose. First, to remove any foreign material which might derail the car; second, to push aside a person's foot should he be standing with a foot partially over the rail.

Rule 221. Band Mill.

The failure of a band-saw wheel, while of rather infrequent occurrence, is almost certain to result in a very serious accident and may involve a number of men. Two such accidents have occurred in Southern pine operations within the last few years.

Rule 222. Circular Mill.

(*c*) This clearance requirement is to eliminate the possibility of slabs falling and jamming between the saw and any obstruction. Such jamming would probably result in the breaking of the saw.

Rule 223. Rock Saw.

(*b*) This exhaust hood is suggested to protect the sawyer from flying sawdust.

SEC. 23. LIVE ROLLS, EDGERS, GANG SAWS, AND RESAWS.

Rule 230. Live Rolls.

(*e*) A number of accidents due to the spiked live rolls catching in the clothing of operators have been reported. Ordinarily their use is not necessary except on log jacks or conveyors where considerable grade is encountered.

Rule 231. Edger.

(*f*) Such openings in edger frames may offer hazard from two sources, either by bringing an oiler's hand in contact with the sawing or by allowing edging knots or other material to be thrown through them. (See fig. 46.)

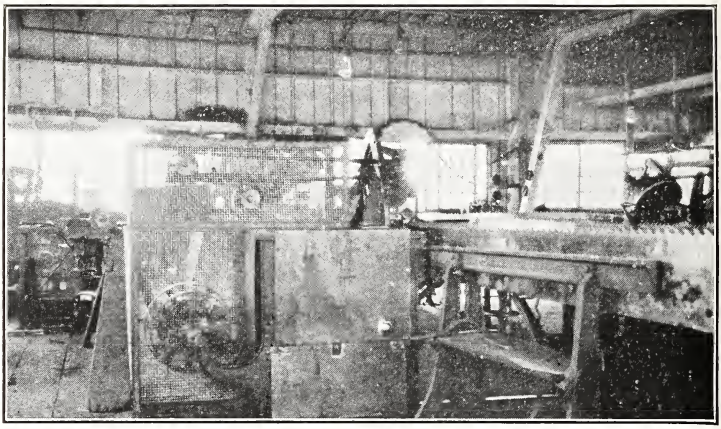

FIG. 53.—*Guards for band-saw grinder; side view.* (*Rule 268.*)

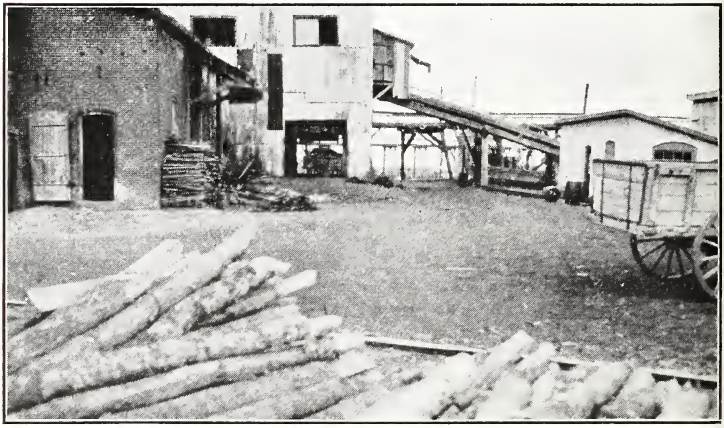

FIG. 54.—*Exceptional housekeeping in mill yard; slabs carefully piled, and driveways clear of refuse.* (*Section 30.*)

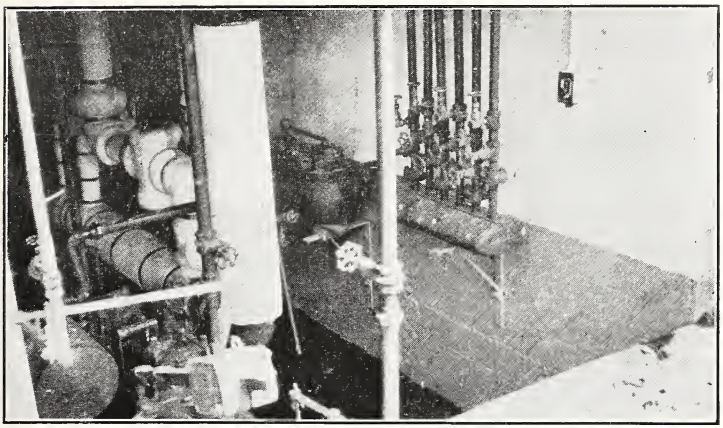

FIG. 55.—*Kiln control pit; steam pipes insulated.* (*Rule 300.*)

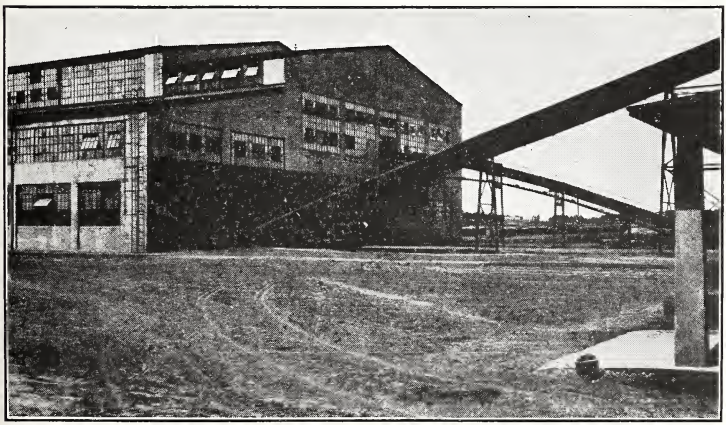

FIG. 56.—*Another well-kept mill yard.* (*Section 30.*)

SEC. 24. TRIMMERS, SLASHERS, AND TRANSFER TABLES.

Rule 240. Overhead Trimmer.

(*a*) Emphasis should be put on the strength necessary for guards of this kind. Figure 47 shows a barricade made of 2-inch planking which has been pierced by a piece of material thrown from the saws. The guards in many mills consist of 1-inch boards on a 3 by 4 inch frame. Such guards offer

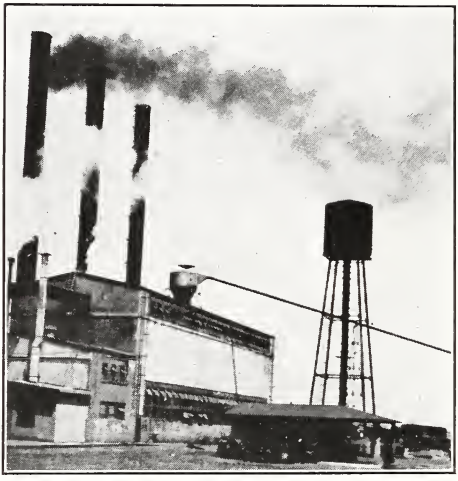

FIG. 57.—*Spark screens on boiler smoke stack to prevent flying embers.*

See also guarded ladder to the water tower. (Rule 270.)

but scant protection when a large piece of material is thrown. Three-inch material would be preferable. (See fig. 48.)

Rule 242. Swing Cut-Off Saw.

(*c*) A relatively large number of accidents occur on saws of this type through the failure of the counterweight. Some of these accidents are attributed to the counterweight working loose on the rod and dropping on the operator, while

others are due to the saw frame swinging forward when the counterweight has dropped off. Both types of such accidents are of too frequent occurrence.

SEC. 30. DRY KILNS.

Rule 301. Clearances.

Numerous accidents are reported where men are caught and crushed between the wall of a kiln and a loaded car.

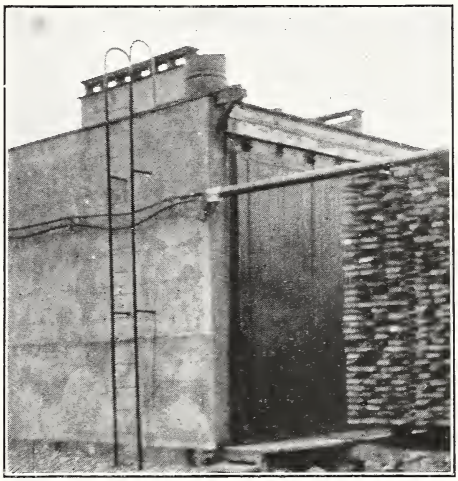

FIG. 58.—*Permanent ladder to provide access to the roof of dry kiln. (Rule 303.)*

The more modern kilns are all built with clearance of 18 to 24 inches.

Rule 302. Exits.

Not less than three fatal accidents have been reported within the last two years due to men being trapped within a kiln. In the South the negro laborers are fond of going in the kiln on cool mornings to get warm. Should the main

door be shut and the steam turned on, especially if the man in the kiln be asleep, a fatal accident will probably result.

From a purely operating standpoint, the small door permits inspection of the lumber in the kiln without loss of heat that would occur if the entire door was opened.

Rule 303. Ladders.

Figure 58 shows a substantial ladder giving access to vents on top of the kiln. Where it is necessary for operators to frequently adjust such shutters or dampers on the roof, a permanent ladder should be provided.

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