

COMPARISON SHEET

MACHINE	5-31	180-37	200-37
Boom Length	100'	120'	125'
Bucket	3 1/2 AX	5 AX	5 AX
Boom Angle	30°	30°	30°
Allowable Load	17,200#	26,500#	26,500#
Dumping Height	39'0"	47'0"	55'0"
Dumping Reach	96'0"	115'0"	122'0"
Digging Reach	96'0"	119'0"	120'0"
Digging Depth	50'0"	55'0"	75'0"
Clearance Radius	27'11"	28'0"	28'6"
Clearance Under Frame	2'8-3/8"	3'5"	4'0"
Height of Cab	16'0"	16'2 1/2"	19'0"
Height of A-Frame	29'8"	32'9 1/2"	36'3"
Height of Boom Foot Pin	5'1"	5'4 1/2"	7'10"
Center Boom Foot Pin - Center of Rotation	9'11"	10'6"	12'6"
Working Weight	305,000#	358,000#	407,000#
Net Horsepower	250	475	495
Approximate Price	---	\$165,000.00	\$194,500.00
Approximate Erection Time	7-10 days	7-10 days	30 days
Approximate Delivery	---	12 mos.	6 mos.

BUCYRUS-MONIGHAN COMPANY

CHICAGO, ILL. U. S. A.

SPECIFICATIONS OF A MODEL 3-W DRAGLINE EXCAVATOR DIESEL DRIVEN

Bucket.....Cu. Yds.

Boom.....Ft. Long

The following specifications cover a Model 3-W Dragline Excavator equipped with walking traction mounting and arranged to operate from a Diesel engine power plant. The machine is to be equipped with boom and drag bucket as specified by the purchaser and selected from available combinations.

WALKING TRACTION MOUNTING

Self-Contained Traction Unit:

The machine will be mounted on self-contained, walking traction mounting composed of three major parts each side of the revolving frame, consisting of an eccentric cam, elongated track frame and shoe.

Positive Walking Motion:

The cam is an alloy steel casting having a flanged tread to engage the track and is square bored to fit the walker shaft.

Longitudinal and Lateral Oscillations of Shoes:

Fitted into the cam is a crank pin carrying a roller, located in a position diametrically opposite the walking shaft, at a distance which determines the length of the step of the walking traction.

The cam is located within the track frame which is made in two halves bolted together and braced by two "T" shaped castings, bolted to the track frame, and forming a guide for the cam roller. The track frame is an alloy steel casting having a track section for the cam. The lower half has rounded faces which rest in concave bearings on the shoe. The frame is held to the shoe bearings by caps fitted over the rounded sections, allowing the shoe to swivel on the track frame to adjust its bearing to irregular ground conditions.

Shoes Welded Structural Units: Anti-Skid Cleats:

The shoes are made of longitudinal I-beam members braced by cross members welded together to form a box construction. The lower face is curved upward at the forward end to provide a climbing angle and the shoe is entirely plated on the top and bottom. Cleats across the bottom of the shoe prevent skidding during the walking motion.

WALKING SHAFT AND DRIVE

Simple Drive Machinery:

The walking operation is accomplished through the alternate placing of the shoes on the ground and tilting and skidding the entire machine and its base on the ground. This operation is accomplished by the cams turning in the track frames on the shoes.

Shoes Held High Above Ground During Digging Operation:

The cams are carried on square ends of a large diameter three section forged steel walking shaft extending across the revolving frame. This shaft is located ahead of the center of gravity of the machine when traveling to provide proper weight distribution. The outer sections are supported in special large bearings in tower framings at each side of the revolving frame. The center section is supported in bearings in the machinery side frames. The right side outer section and center section are connected by large flanges integral with the shaft bolted to the hub of the walking shaft gear by means of finished bolts. The left side outer section and center section are connected by large integral flanges and finished bolts. Providing a three section shaft facilitates shipping and assembling. The bearings have renewable bronze bushings.

Large Diameter Brake:

The shaft is driven through the gear meshing with a pinion on the extended drum shaft. The pinion is engaged by a positive jaw clutch operated by a double acting air thrust cylinder controlled from the operator's station. The pinion is combined with a large diameter brake housing carrying an outside band brake of wide face, which brake is spring set and air released by the clutch operating cylinder. The brake is used to hold the shoes off the ground when the machine is digging and swinging.

BASE

Rigid Welded Structure to Support Machine:

The base is a circular structural steel unit of welded steel construction, on which are mounted the swing rack segments and the rail for the turntable rollers. It consists of a continuous I-beam bent to circular form, braced by cross I-beams securely attached to the outer circle beam and to each other. The roller rail is supported on and attached to the outside I-beam so as to form a continuous support. The entire base is covered on the top and bottom with steel plates. Covered openings are provided in the top plating to provide access to each structural division. To facilitate shipment the base is made in sections and is assembled in the field.

Center Castings:

At the center of the base is the center casting which is carefully fitted and securely bolted to the base. This casting fits into the revolving frame center casting, centering the machine.

Swing Racks:

The swing racks are cast steel segments with outside teeth of large pitch, and are firmly bolted together and to the structural support members of the base.

ROLLER CIRCLE

Continuous Circle of Double Flanged Rollers:

The roller circle consists of a large number of cast steel, double flanged rollers, revolving between two rail circles, one attached to the revolving frame and one attached to the base. The roller frame is composed of an inside and outside bar, both being rolled to circular form and separated by large diameter pins on which the rollers are spaced. These pins act as spacers only to position the rollers. Means of lubricating the rollers are provided on each roller pin.

REVOLVING FRAME

- Structural Framing:** The revolving frame is composed of multiple heavy I-beam members securely welded together. The longitudinal inside sills are deep section I-beams, tied at the front and rear by heavy members. The beams are spaced and tied together by transverse I-beams between which are longitudinal I-beams to provide supports for the machinery and for the full circle revolving frame roller rail. The entire frame is plated on top and bottom to add rigidity to the entire unit. Space is provided at the rear end for the required ballast.
- Inside Sills Deep Section I-beams:**
- A-frame Structure:** The A-frame is constructed of welded members, pin connected to the revolving frame. The apex of the A-frame is high, minimizing the tackle loads and the compression load in the boom.
- Tower Structure:** Extending outwardly from the sides of the main revolving platform are two wing shaped structures supporting the overhanging upper rail and providing supports for the outer bearings of the walking shaft, which shaft supports consist of diagonal members extending from the outside edges of the wing structures to the top of the house. A welded box section at the lower end of the diagonal members support the bronze bushed, outboard bearings for the walking shaft.
- Lifting Hooks Relieve Center Bearing Loads:** Attached to the underside of the revolving frame diametrically opposite the front end of the frame, are two hooks, spaced each side of the longitudinal center of frame. These hooks engage the upper flange of the base beam and relieve the center pintle when tilting the base during the walking motion.

MAIN MACHINERY

- Single Part Hoist Single Part Drag Rope:** The main machinery is designed to handle the hoisting of the bucket on a single-part hoist and the digging of the bucket on a single-part rope. The hoist rope leads from the hoist drum to the boom point sheave and is attached directly to the bucket hoist bail. The drag rope leads from the drum, through the fairlead, directly to the digging bail of the bucket.
- Machinery Mounted As Unit on Frame:** The main machinery is constructed in a unit, which is attached to the revolving frame center sills. The bearings for the shafts are contained in unit steel side frames, and have renewable bronze shells.
- Simple Machinery:** The machinery consists of a single drum shaft driven by the transmission pinion meshing with the drum shaft gear.
- Unit Drum Assembly:** The hoist and drag drums are each composed of the barrel, the brake housing and the friction housing. These housings have brass bushed hubs running free on the shaft and the drum barrels are secured to the housings. For easy replacement or change of drum diameters, the drums may be removed and replaced without disturbing the housings or removing the shaft. The drum shaft gear is fixed to the shaft.
- Air Operated Friction Clutches:** The friction clutches are of the outside band type, of large diameter and wide face, and are lined with asbestos lining. These clutches are operated by air cylinders attached to the arms of the gear or spider, the air to the cylinders being controlled by air valves.
- Large Diameter Wide Face Brakes:** The brakes are of the outside band type, of large diameter and wide face, and are lined with asbestos lining. The brakes are operated by foot pedals at the operator's stand. The brake linkage is arranged to provide ample brake pressure for ease of operation while giving the operator a "feel of the brake."
- Forged Shafts, Cut Gear Teeth:** All shafts are steel forgings, and all gears have teeth cut from the solid metal.

TRANSMISSION

- Dry Plate, Single Disc Clutch:** The transmission unit consists of a bevel gear and pinion mounted on anti-friction bearings contained in an oil tight housing. The single disc, dry plate, clutch is controlled from the operator's stand. The bevel gear shaft, mounted in anti-friction bearings, is extended beyond the housing and carries the transmission pinion which meshes with the drum shaft gear. The outboard end of this shaft is supported in an anti-friction bearing carried in a housing integral with the bevel gear housing, assuring alignment. The bevel gear and pinion run in oil and all bearings except the outboard bearing are lubricated from the gear case.
- Gears Enclosed in Oil Case:**

SWING MACHINERY

- Constructed and Mounted as a Unit:** The swing machinery is contained in a unit base built into the front end of the revolving frame. The unit consists of bevel and spur gear reductions from the motor to the vertical rack pinion shaft, which are enclosed, run submerged in oil, and with the exception of the rack pinion shaft, are mounted on taper roller bearings. The rack pinion shaft mounted in bronze bushings is provided with a spur pinion at the lower end which engages the swing rack on the base. With the exception of the motor, and first gear reduction, the entire swing machinery is contained within the base where it is completely protected. The various parts of the machinery subject to inspection are accessible. All gears except the rack pinion have teeth cut from solid metal.
- Brake:** A hand lever operated band brake is provided for emergency.

DAGLINE FAIRLEAD

- Universal Fairlead:** A universal fairlead for the drag rope is mounted on the front of the revolving frame, composed of two horizontal and two vertical sheaves. The sheaves are mounted on bronze bushings in a swivel frame. The frame is free to swing laterally in line with the lead of the drag rope. The sheaves are of heat-treated alloy steel and have turned grooves for the rope. The swivel bearings are bronze bushed, and all bearings are protected against the intrusion of dirt.
- Sheaves Mounted in Swivel Frame:** Renewable guards for leading the rope onto the sheaves are securely fastened to the swivel frame.

BOOM

- Boom, Welded Construction:** The boom is of all welded construction, composed of four L-shaped chord members, latticed on the four sides. The lower end is provided with heavy plate foot construction, securely attached to the chord members.
- Point Sheave On Roller Bearings:** Attachments for the boom suspension sheaves are provided at the upper end of the boom. The bucket hoisting sheave is an alloy steel casting with machined groove, mounted on roller bearings.

BOOM SUSPENSION

Positive Control
of Raising or
Lowering:

The boom is raised and suspended by a suspension tackle, operated by a self-contained, worm gear driven drum. Power is furnished by the swing motor. The boom hoist is reversible and a safety band brake is provided to prevent creeping. Both raising and lowering operations are positive and under control at all times.

BUCKET

Selected to Suit
Work:

A dragline bucket of the type and size specified will be furnished. The bucket will be constructed to withstand the service for which it is intended and will have good digging and filling qualities. Hoist and drag bails of chain, and a dump sheave and rope are furnished.

OPERATING LEVERS

Arranged for Easy
Operation and Clear
View of Work:

The operating levers are located at the forward end of the revolving frame, to the right of the boom, giving the operator a clear, unobstructed view of the work. The hoist and drag brakes are operated by foot treadles.

ROPES

Complete Rope
Equipment:

A complete set of ropes for the machine is supplied consisting of the hoist, drag and boom hoist ropes.

BALLAST

Furnished by
Purchaser:

Space is provided in the revolving frame for the required amount of ballast which will be furnished by the purchaser. Steel punchings or scrap are suitable for this purpose.

TOOLS

Tools Furnished:

A suitable assortment of tools is furnished, composed of one large capacity jack, an alemité gun, a complete set of wrenches, hammer and oil cans.

HOUSE

All Steel Construction,
Paneled Sides:

The house is constructed entirely of steel, with paneled sides attached to steel arch truss frames. The steel roof covers the entire center section of the revolving frame. Doors and windows are provided where necessary. The front of the machine is enclosed and provided with large sliding windows in front of the operator's stand.

POWER PLANT

Vertical Mechanical
Injection, Diesel
Engine:

The power for driving the machine is furnished by a multiple cylinder, two cycle, vertical type mechanical injection, Diesel engine, constructed to meet requirements of excavating machine service. All moving parts of the engine except flywheel are enclosed.

Cylinders Cast
Separately:

The cylinders are cast separately and are provided with water jackets of liberal size. The cylinder head joints are sealed against gas pressure by means of copper gaskets. The heads contain the air starting valve and fuel nozzles.

Force Feed Auto-
matic Oiling:

The upper and lower base consists of two castings. The lower base is a heavy casting provided with wide box section flanges extending the full length on both sides. Integrally cast bridges of heavy section support the main bearings. These bridges, or webs, together with corresponding members in the upper base serve as partitions for the individual crank pits or compartments. The upper base is a single casting of sturdy cross section. Large openings on each side of the individual crank chambers afford access to the crank pins and main bearings.

The lubricating system is entirely automatic. There are no oil holes or hand oiling devices, and only occasional inspection of the lubricating system is required.

The engine is equipped with governor, speed regulator, fuel pump and lubricator. An auxiliary air compressor, belt driven from a gasoline engine, supplies air for starting the main engine. A reservoir with piping, safety valve and gauge is connected to the compressor.

The fuel oil tank is located at the rear of the revolving frame and the fuel is taken from the tank by a fuel pump on the engine. Filters and strainers are provided for both fuel and lubricating oil. A hand operated pump is furnished for filling the fuel tank.

Radiator:

The cooling water for the engine is circulated by a built-in water circulating pump through a large radiator of the tube and fin type composed of large top and bottom tanks and separate interchangeable cores. Individual cores may be removed for repair or replacement. The radiator is equipped with a "V" belt driven fan.

Separate Air
Compressor:

A "V" belt driven air compressor is provided to furnish the air for the operation of the clutches and brakes.

ELECTRICAL EQUIPMENT

Belt Driven Generator
and Exciter Units:
Control Simple:
Motor Rugged, Roller
Bearing; Small
Flywheel Effect:
Separately Excited
Fields Affording
Smooth Operation:
Wiring in Conduit:

Power for the swing motor is furnished by a variable voltage generator and an exciter, driven by "V" belts from the transmission input shaft.

The various motor speeds are obtained by voltage control, which is accomplished by means of resistors in the generator fields. The resistance in these fields is varied by means of a master controller at the operator's stand. Provisions are made for automatically limiting the current in a motor to a value which will develop the maximum torque required.

The motor is suitable to high peak duty, having small flywheel effect and satisfactory for the requirements of the severe intermittent, varying speed service. It has a large shaft running in roller bearings. The motor has commutating poles and separately excited main field windings.

As far as possible all wiring is in the conduit.

Light Plant:

Current for lights is furnished by the exciter which serves as a generator. A regulator is furnished to maintain constant voltage. The light includes reflector type lamps on the underside of the boom, lights for the interior and exterior of the house, and connections for extension cords, together with fixtures and switches.

GENERAL

The entire machine is built of sound high-grade material throughout, and in a workmanlike manner, so as to operate properly under normal use and with proper attention. Accessibility for renewal of parts without complete dismantling and avoidance of complicated mechanism have been followed in the design. Special attention has been given to efficiency, by elimination of excessive friction of moving parts, and provisions have been carefully made to provide for easy and efficient lubrication.

A platform is provided at the boom point to provide a footing for the operator when lubricating and inspecting point sheaves.

All structural material is in conformity with the requirements of A. S. T. M. specifications. All steel castings are made of special or alloy steels and are carefully selected for the various duties they are called upon to perform. Certain steel castings, particularly those subject to heavy duty and severe stress, undergo a special heat treatment to give desired qualities.

All parts of the machine are well painted in a neat manner before shipment. No oil or other material used on the machine and subject to consumption during operation is furnished by Bucyrus-Monighan Company.

It is the policy of Bucyrus-Monighan Company to improve its products continually. The right is reserved to make changes in specifications or design which, in the opinion of this Company, are in accord with this policy or which are necessary because of the unavailability of materials. These specifications are for the purpose of identifying the exact type of machine sold, and do not limit or extend the express warranty contained in the contract of sale.

END OF SPECIFICATION

BUCYRUS-MONIGHAN COMPANY

MODEL 3-W DRAGLINE EXCAVATOR

DIESEL ENGINE DRIVEN

MAIN SPECIFICATIONS

*Net weight, domestic, including bucket, approximate.....	177,000 lbs.
Working weight, including bucket, approximate.....	207,000 lbs.
Ballast required, furnished by purchaser, maximum, (varies with boom length).....	20,000 lbs.
Shipping weight, prepared for export, including bucket, approximate.....	192,000 lbs.
Ships option tons.....	185

*Add 4,000 lbs. blocking on cars, when estimating freight for domestic delivery.

Walking Traction Mounting:

Width and length of shoes.....	3'-0"x20'-0"
Area of both shoes.....	120 sq. ft.
Diameter of cam.....	4'-4"
Length of step.....	6'-0"
Overall width over shoes.....	24'-0"
Diameter of walking shaft.....	8"-(at towers 9")
Walking speed, normal engine speed.....	0.27 mi. per hr.

Base:

Outside diameter.....	17'-0"
Bearing area.....	227 sq. ft.
Diameter rail circle.....	16'-6"
Size and weight of roller rail per yard.....	5"—104 lbs.
Number and diameter of rollers.....	20—10"
Pitch diameter swing rack.....	12'-8 $\frac{3}{4}$ "

Revolving Frame:

Width and length (shipping center section).....	10'-0"x28'-11 $\frac{1}{2}$ "
Depth, outside sill members.....	20"
Depth, inside sill members.....	20"

Machinery:

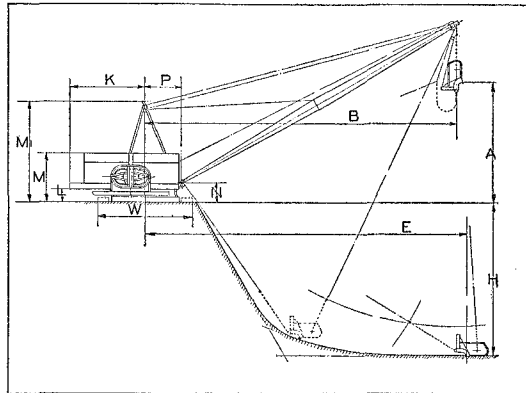
Hoist drum, grooved.....	30" P. D.
Hoist rope speed, rated load.....	188 f.p.m.
Drag drum, grooved.....	25" P. D.
Drag rope speed, average digging pull.....	139 f.p.m.
Diameter of hoist rope, 1 part.....	1"
Diameter of drag rope.....	1 $\frac{1}{4}$ "
Diameter of boom hoist rope, 4 part.....	1"
Hoist rope sheave, boom point.....	22" P. Dia.

Engine:

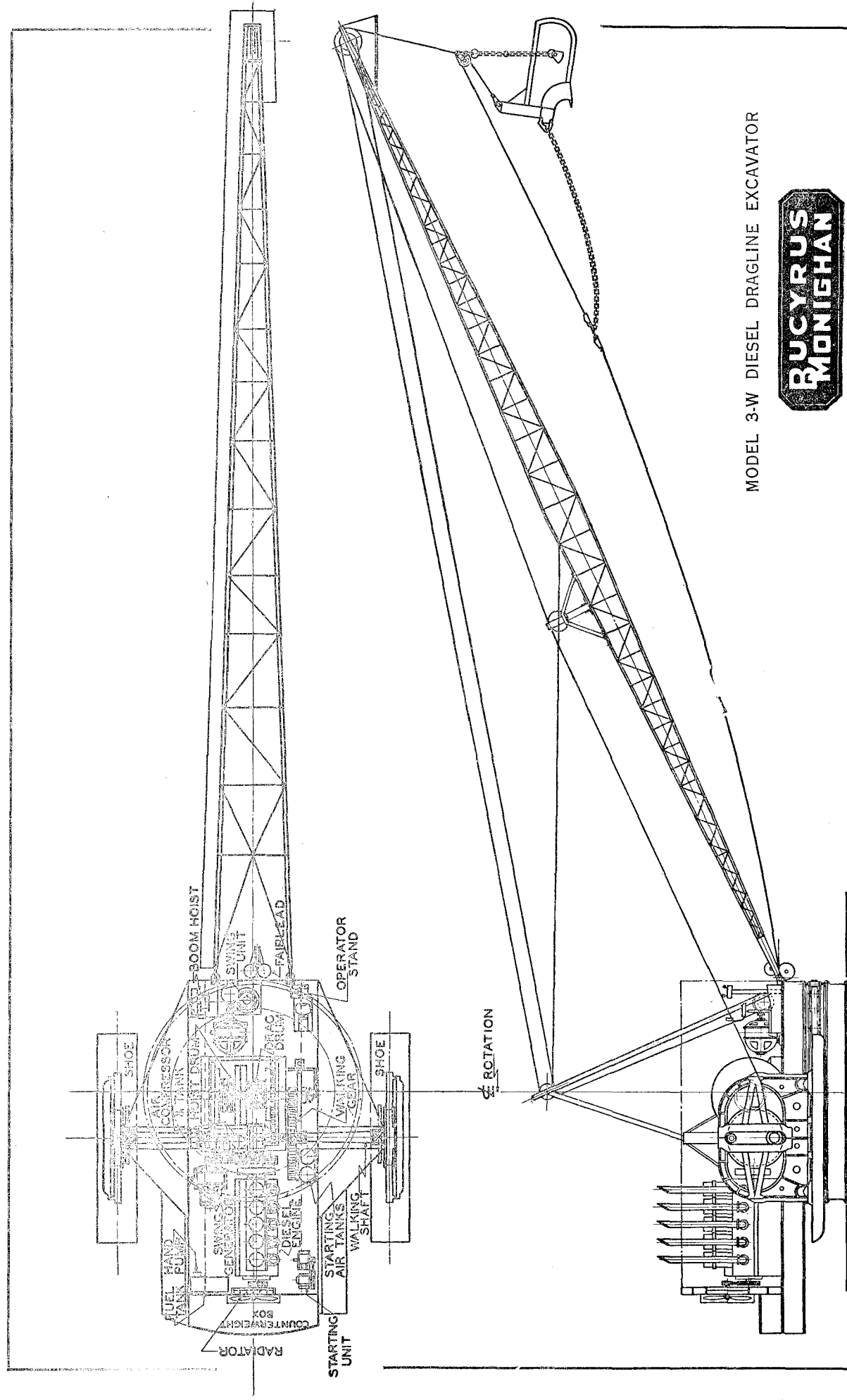
Make—Fairbanks-Morse Type 35 F—5 cylinder.	
Bore and Stroke.....	8 $\frac{3}{4}$ "x10 $\frac{1}{2}$ "
Normal speed.....	450 r. p. m.
Horsepower rating (Excavator Service).....	190
Capacity of fuel tank.....	200 U. S. Gals.
Capacity of water system.....	50 U. S. Gals.

Electrical Equipment:

Swing motor—230 v. 50° C. Cont.....	25 h.p., 690 r. p. m.
Generator, W. L. control.....	Capacity to suit motor



	80'			90'		
	3 $\frac{1}{2}$ cu. yd. Type AX 18,000			3 cu. yd. Type AX 16,000		
Length of boom	25°	30°	35°	25°	30°	35°
Capacity and type of bucket, average work.....	24'	30'	36'	28'	35'	42'
Allowable suspended load, lbs.....	82'	79'	76'	91'	87'	83'
Angle of boom	84'	81'	78'	93'	89'	85'
Dumping height, approx., with bucket shown.....	44'	40'	36'	50'	45'	40'
Dumping reach	50'	46'	42'	56'	51'	46'
Digging reach, under boom point.....	20'-3 $\frac{1}{2}$ "					
Digging depth, favorable conditions.....	3'-3"					
Depth bucket can be lowered under boom point, std. ropes.....	12'-8"					
Clearance radius of revolving frame.....	25'-6"					
Clearance under frame to ground.....	5'-3"					
Height of house above ground.....	9'-0 $\frac{1}{2}$ "					
Height of A-frame above ground.....	24'-0"					
Height of boom foot pin above ground.....	18'-0"					
Distance boom foot pin to center of rotation.....						
Overall width of walking shoes.....						
Clearance radius of shoes—maximum.....						



MODEL 3-W DIESEL DRAGLINE EXCAVATOR



BUCYRUS-MONIGHAN COMPANY

MODEL 5-W DRAGLINE EXCAVATOR

DIESEL ENGINE DRIVEN

MAIN SPECIFICATIONS

*Net weight, domestic, approximate.....	300,000 lbs.
Working weight, approximate.....	335,000 lbs.
Ballast required, furnished by purchaser, maximum (varies with length of boom).....	30,000 lbs.
Shipping weight, prepared for export, approximate.....	320,000 lbs.
Ships option tons.....	320

*Add 8,000 lbs. blocking on cars when estimating freight for domestic delivery.

Walking Traction Mounting:

Width and length of shoes.....	4'-0"x25'-0"
Area of both shoes.....	200 sq. ft.
Diameter of cam.....	4'-8 1/4"
Length of step.....	6'-0"
Overall width over shoes.....	33'-0"
Diameter of walking shaft.....	9"-(at towers 10")
Walking speed, normal engine speed.....	0.20 mi. per hr.

Base:

Outside diameter.....	24'-0"
Bearing area.....	452 sq. ft.
Diameter rail circle.....	18'-0"
Size and weight of roller rail per yard.....	5"-104 lbs.
Number and diameter of rollers.....	40-10"
Pitch diameter swing rack.....	14'-8"

Revolving Frame

Width and length (shipping center section).....	9'-10"x41'-2"
Depth, outside sill members.....	18" channel
Depth, inside sill members.....	18" I-Beams.

Machinery:

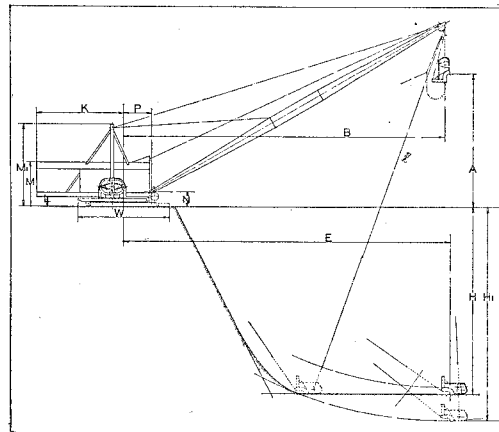
	100' Boom	120' Boom	135' Boom
Hoist drum, grooved.....	34 1/2" P.D.	37 1/4" P.D.	40" P.D.
Speed of hoist, 1 part (average bucket and load)	178 f.p.m.	190 f.p.m.	206 f.p.m.
Drag drum, grooved.....	34 1/2" P.D.	37 1/4" P.D.	40" P.D.
Speed of drag rope (average digging pull)	155 f.p.m.	167 f.p.m.	178 f.p.m.
Hoist rope, dia. 1 part ..	1 1/4"	1 1/4"	1"
Drag drum, grooved.....	1 1/2"	1 1/2"	1 3/8"
Boom hoist rope, dia.			
10 part	7/8"	7/8"	7/8"
Boom point sheave, for hoist rope, dia.	34" P.D.	34" P.D.	34" P.D.

Engine:

Make—Fairbanks-Morse Model 35F.	
Bore and stroke.....	10"x12 1/2"
Normal speed.....	400 r. p. m.
Horsepower rating (Excavator Service).....	300
Horsepower rating (continuous).....	240
Capacity of fuel tank.....	600 U. S. Gals.
Capacity of water system.....	140 U. S. Gals.

Electrical Equipment:

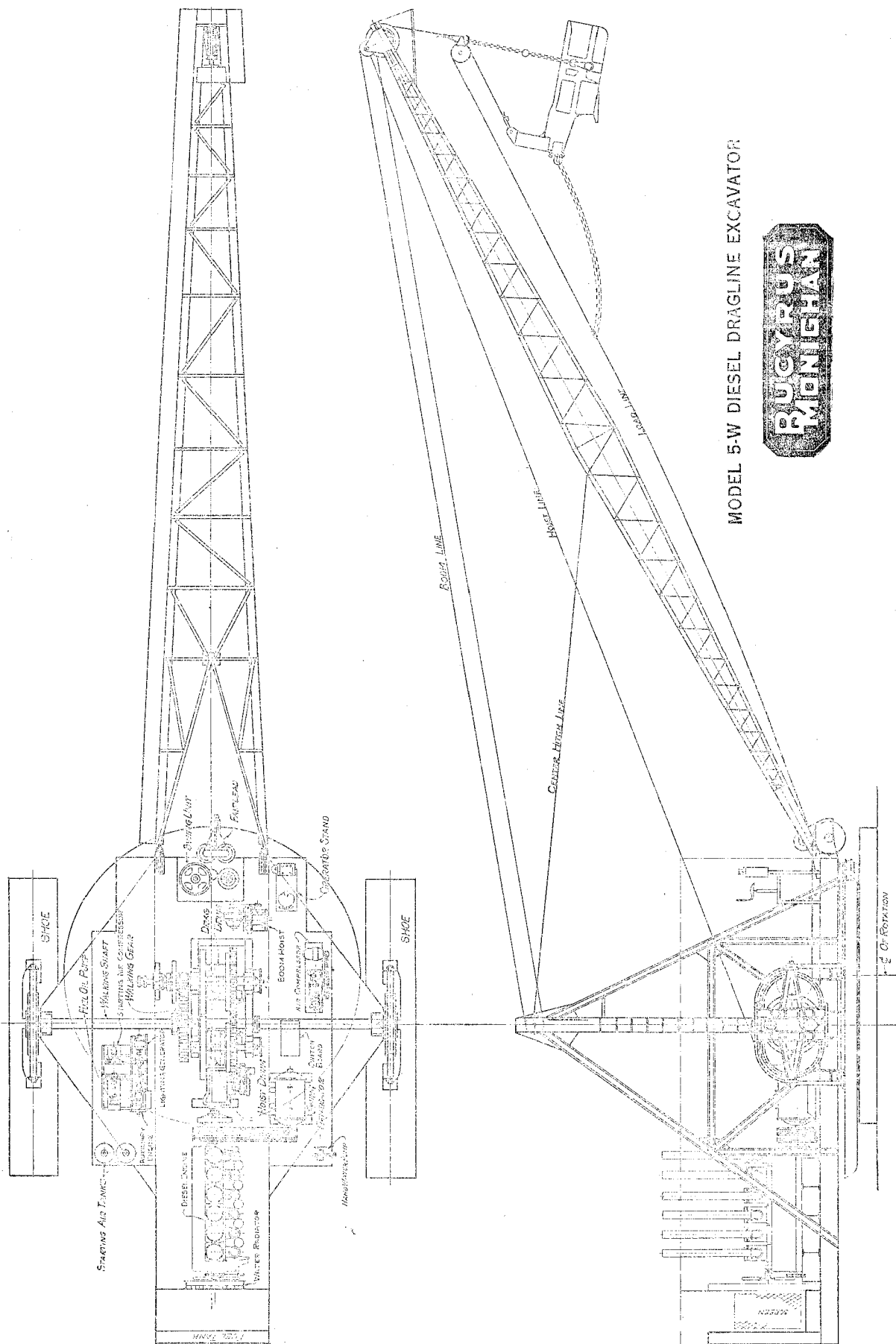
Swing motor—230 v. 50° C. Cont.....	40 h. p., 550 r. p. m.
Generator, W.L. control.....	Capacity to suit motor



WORKING RANGES

(Capacity of buckets figured with contents weighing 3,000 lbs. per cu. yd.)
(Digging depth varies with character of material.)

	100'-0"			120'-0"			135'-0"		
	6 cu. yd. Type AX			5 cu. yd. Type AX			4 cu. yd. Type AX		
Length of Boom.....									
Capacity and Type of Bucket—Ordinary Work....									
Angle of Boom.....	25°	30°	35°	25°	30°	35°	25°	30°	35°
Allowable Suspended Load—Lbs.....	30,000	30,000	30,000	25,500	25,500	25,500	20,500	20,500	20,500
Dumping Height, with bucket shown.....	28'-0"	36'-0"	43'-0"	38'-0"	47'-0"	56'-0"	46'-0"	56'-0"	66'-0"
Dumping Reach.....	102'-0"	98'-0"	93'-0"	120'-0"	115'-0"	110'-0"	134'-0"	128'-0"	123'-0"
Digging Reach, under boom point.....	103'-0"	102'-0"	97'-0"	124'-0"	119'-0"	114'-0"	138'-0"	132'-0"	127'-0"
Digging Depth, favorable conditions.....	58'-0"	50'-0"	42'-0"	70'-0"	60'-0"	50'-0"	81'-0"	70'-0"	60'-0"
Depth bucket can be lowered under boom point, std. ropes.....	65'-0"	59'-0"	52'-0"	80'-0"	72'-0"	64'-0"	92'-0"	83'-0"	74'-0"
Clearance radius of revolving frame.....									
Clearance under frame to ground.....									
Height of house above ground.....									
Height of A-frame above ground.....									
Height of boom foot pin above ground.....									
Distance boom foot pin to center rotation.....									
Overall width of walking shoes.....									
Clearance radius of shoes.....									



MODEL 5-W DIESEL DRAGLINE EXCAVATOR

**BUCCYRUS
ERIE**

BUCYRUS-MONIGHAN COMPANY

CHICAGO, ILL. U. S. A.

SPECIFICATIONS OF A MODEL 7-W DRAGLINE EXCAVATOR DIESEL DRIVEN

Bucket.....Cu. Yds.

Boom.....Ft. Long

The following specifications cover a Model 7-W Dragline Excavator equipped with walking traction mounting and arranged to operate from a Diesel engine power plant. The machine is to be equipped with boom and drag bucket as specified by the purchaser and selected from available combinations.

WALKING TRACTION MOUNTING

- Self-Contained Traction Unit:** The machine will be mounted on a self-contained, walking traction mounting composed of three major parts each side of the revolving frame consisting of an eccentric cam, elongated track frame and shoe. The cam is an alloy steel casting having a concave shaped face to engage the track and is square bored to fit the walking shaft.
- Positive Walking Motion:** Fitted into the cam is a crank pin carrying a roller, located in a position diametrically opposite the walking shaft, at a distance which determines the length of the step of the walking traction.
- Longitudinal and Lateral Oscillations of Shoes:** The cam is located within the track frame which is made in two halves bolted together and braced by two "I" shaped castings, bolted to the track frame castings, and forming a guide for the cam roller. The track frame is an alloy steel casting having a convex track section for the cam. The lower half has rounded faces which rest in concave bearings on the shoe. The frame is held to the shoe by caps fitting over rounded sections, allowing the shoe to swivel on the track frame to adjust its bearing to irregular ground conditions.
- Shoes, Welded Units:** The shoes are made of longitudinal I-beam members braced by cross members welded together to form a box construction. The lower face is curved upward at the forward end to provide a climbing angle and the shoe is entirely plated on the top and bottom. Cleats across the bottom of the shoe prevent skidding during the walking motion.
- Anti-Skid Cleats:**

WALKING SHAFT AND DRIVE

- Simple Drive:** The walking operation is accomplished through the simultaneous placing of the shoes on the ground and then tilting and skidding the entire machine and its base on the ground. The operation is accomplished by the cams turning in the track guides on the shoes.
- Sectional Shaft to Facilitate Shipment and Erection:** The cams are carried at the ends of a large diameter, two section, forged steel walking shaft extending across the revolving frame. This shaft is located ahead of the center of gravity of the machine when traveling to provide proper weight distribution, and is supported in special large bearings at each side of the revolving frame. The inner ends of the sections have large flange couplings and are bolted to the hub of the walking shaft gear by means of finished bolts. Additional bearings are provided where required to give adequate support for the shaft. The bearings have renewable bronze bushings.
- Brake holds Shoes above ground when Operating:** The shaft is driven through the walking gear meshing with a pinion on the extended drag drum shaft. The pinion is engaged by a positive jaw clutch operated by a double acting air thrust cylinder controlled from the operator's station. The pinion is combined with a large diameter brake housing carrying an outside band brake of large diameter and large face, which brake is spring set and air released by an air cylinder controlled by the operator. The brake is used to hold the shoes off the ground when the machine is digging and swinging.

BASE

- Strong Structure to Support Machine:** The base is a circular, structural steel, unit of welded construction upon which are mounted the swing rack segment castings and the rail for the turn table rollers. It consists of an outside, continuous, full depth I-beam, bent to circular form, braced by radial and cross I-beams securely attached to the outside beam and to each other. The roller rail is supported by and securely attached to the circular I-beam. At the center of the base is a cast steel center bearing which is securely attached to the base and fits into the revolving frame center bearing, centering the machine. The entire base is covered on top and bottom with steel plates, the top plates having covered openings to provide access to each structural division formed by the radial and cross I-beams. To facilitate shipment the base is made in sections and assembled in the field.
- Center Casting:**
- Cast Steel Swing Rack Gear Segments:** The rack segments are steel castings having outside teeth of large pitch, and are bolted together to form a continuous rack gear assembly.

ROLLER CIRCLE

- Continuous Circle of Double Flanged Rollers:** The roller circle consists of a large number of double flanged rollers, revolving between two rail circles, one attached to the revolving frame and one attached to the base. The roller frame is composed of two heavy bars, one on the inside and one on the outside, both being rolled to circular form and separated by large diameter pins on which the rollers are spaced. These pins act only as spacers to position the rollers. Means of lubricating the rollers are provided at each roller pin.

REVOLVING FRAME

Two Unit Structure:	The revolving frame is composed of two main units, an upper frame and a deep section under frame.
Upper Frame:	The upper frame is composed of longitudinal I-beam members, tied together at the front and rear by channel members and having intermediate transverse and longitudinal I-beam members acting as further ties and also as supports for the machinery. The upper frame is plated over its entire area.
Under Frame:	The under frame is composed principally of two deep section, wide spaced transverse girders; located fore and aft of the center of rotation, suitably tied together with I-beam girders which support the bearings for the walking shaft. Deep section girders extend forward to the front end of the frame and form the support for the upper rail of the roller circle. Tapered girders extend to the rear of the frame from the rear transverse girder and support the upper frame members.
Deep Section Frame Eliminates Truss:	The entire unit forms a deep section rigid frame and eliminates the necessity of a truss framing above the revolving frame.
A-Frame:	Built onto each outside longitudinal girder of the frame is the A-frame structure composed of diagonal members, tied together with large gussets. The front and rear members are extended high above the revolving frame to form the outside members of the A-frame. These outside members are connected at their apex by a cross member, and suitable bracing is provided to add rigidity to the entire unit.
Overhead Crane:	A crane is provided, having longitudinal and transverse travel to facilitate removal of machinery parts. Means are provided for attachment of a chain block, but no chain block is furnished.
Lifting Hooks:	Attached to the underside of the revolving frame, are two hooks, spaced one each side of the longitudinal center of the frame. These hooks engage the upper flange of the base beam. They relieve the center pintle when tilting the base during the walking motion.

MAIN MACHINERY

Single Part Hoist:	The main machinery is designed to handle the hoisting of the bucket on a single-part hoist and the digging of the bucket on a single-part rope. The hoist rope leads from the hoist drum over the boom point sheave and is attached directly to the bucket hoist bail. The drag rope leads from the drum, through the fairlead, directly to the digging bail of the bucket.
Single Part Drag Rope:	
Mounted as Unit on Revolving Frame:	The main machinery is constructed in a unit, which is attached to the revolving frame center sills. The bearings for the shafts are contained in unit steel side frames, and have renewable bronze shells. The machinery consists of a hoist drum shaft and the drag drum shaft. The drag drum shaft is driven by the transmission pinion meshing with the drag gear and the drag gear meshes with the hoist drum gear.
Drum Assemblies:	The hoist and drag drums are each composed of the barrel, the brake housing and the friction housing. These housings have brass bushed hubs running free on the shaft and the drum barrel, made in two halves, is clamped between them by large bolts. The hoist and drag drum gears are fixed to their shafts.
Air Operated Friction Clutches:	The friction clutches are of the outside band type, of large diameter and wide face, and are lined with moulded asbestos blocks. These clutches are operated by air cylinders attached to the arms of the gears, the air to the cylinders being controlled by electrically operated air valves.
Hydraulic Power Brakes:	The brakes are of the outside band type, of large diameter and wide face, and are lined with molded asbestos blocks. The brakes are power actuated through foot pedals at the operator's stand. The drag drum shaft is extended to carry the pinion which drives the walking shaft. This pinion is bronze bushed and is free on the shaft, being engaged by a jaw clutch sliding on the shaft, operated by a double acting air cylinder controlled from the operator's stand. An outboard bearing is provided for the extended drag drum shaft.
Forged Shafts:	
Cut Gears:	All shafts are steel forgings, and all gears have teeth cut from the solid metal.

SWING MACHINERY

Two Vertical Units:	Two swing machinery units are mounted on opposite sides of the revolving frame.
Gears Enclosed:	Each unit consists of a vertical motor driving through enclosed spur gear reductions to the vertical rack pinion shaft, and a spur pinion at lower end of this shaft engages the swing rack on the base. All spur gears have teeth cut from solid metal. The rack pinion is an alloy casting with cast teeth to mesh with the cast teeth of the rack. All shafts are hammered steel forgings and all bearings are of anti-friction type except those for the rack pinion shaft which are bronze bushed.
Swing Brakes:	The motor of each swing unit is provided with a brake which is spring set and air released. The brake is automatically applied in the event of electric power failure or may be applied by the operator through a switch.

DRAGLINE FAIRLEAD

Universal Fairlead:	A universal fairlead for the drag rope is attached to the front girder of the revolving frame. It is composed of two horizontal and two vertical sheaves mounted on shafts running in bearings in a swivel frame, which is free to swing laterally in line with the lead of the drag rope from the position of the bucket. The sheaves are of alloy steel and are fastened to their supporting shafts which turn in anti-friction bearings.
Sheaves Mounted in Swivel Frame:	Renewable cast guards for leading the rope onto the sheaves are fastened to the swivel frame.

BOOM

Welded Steel Construction:	The boom is of all welded construction, composed of four T-shaped chord members, latticed on the four sides by tubular members. The lower end is provided with plate foot construction, securely attached to the chord members.
Light Weight Combined with Strength:	Attachments for the boom suspension sheaves are provided at the upper end of the boom. The bucket hoisting sheave is an alloy steel casting with machined groove, mounted on roller bearings and enclosed in a swivel frame, providing the proper lead for the rope to the bucket.
Swivel Point Sheave:	

BOOM SUSPENSION

Multiple Tackle Hoist:	The boom is raised and suspended by a suspension tackle, operated by a self-contained, worm gear driven drum. Power is furnished by an independent electric motor. The boom hoist is mounted as a unit on the left side of the revolving frame. The motor is reversible and is locally controlled. A safety band brake is provided to prevent creeping. Both raising and lowering operations are positive and under control at all times.
Indendent Motor Driven Drum:	

BUCKET

Selected to Suit Operating Conditions:	A dragline bucket of the type and size specified will be furnished. The bucket will be constructed to withstand the service for which it is intended and will have good digging and filling qualities. Hoist and drag bails of chain, and a dump sheave and rope are furnished.
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Specification No. 3490

OPERATING CONTROLS

- Grouped in Operator's Cab:** The operating controls are grouped in a cab, located on the outside of the house, on the right side of the machine, and high above the floor of frame, giving the operator a clear, unobstructed view of the work.
- Hydraulic Power Actuated Brakes:** The hoist and drag brakes are hydraulic power actuated and are controlled by foot treadles. An adjustable cushion seat is provided for the operator and all controls are located within easy reaching distance from the seat. The large window at the front of the cab is hinged to provide ventilation.

ROPES

- Complete Rope Equipment:** A complete set of ropes for the machine is supplied consisting of the hoist, drag and boom hoist ropes.

BALLAST

- Furnished by Purchaser:** Space is provided in the revolving frame for the required amount of ballast which will be furnished by the purchaser. Steel punchings or scrap are suitable for this purpose.

TOOLS

- Tools Furnished:** A suitable assortment of tools is furnished, composed of one large capacity jack, an alemitte gun, a complete set of wrenches, hammer and oil cans.

HOUSE

- All Steel Construction:** The house is constructed entirely of steel, with paneled sides attached to steel arch truss frames to facilitate erection in the field. The steel roof covers the entire revolving frame. Doors and windows are provided where necessary.

POWER PLANT

- Full Diesel Engine:** The power for driving the machine is furnished by a multiple cylinder, four cycle, vertical type, mechanical injection, full Diesel engine constructed to meet the requirements of excavating machine service.
- Enclosed Construction:** All moving parts of the engine except fly-wheel are enclosed.
- Removable Cylinder Liners:** The cylinders are provided with removable liners and water jackets of liberal size. The cylinder liner joints are sealed water tight by round rubber grommets held in turned recesses. The heads contain the air starting valve and fuel nozzles, relief valves, intake and exhaust valves.
- Lubrication:** The pistons are made long in proportion to diameter to minimize wear from angular thrust, are constructed so that an unbroken surface is in contact with the cylinder wall. The wrist pin is housed on the inside of the piston. The connecting rods are of the solid forged type having upper end forged integral and lower end of the split box type.
- Auxiliary Compressor:** The base forms the main bearing supports. The cylinder block is of box construction and carries the removable cylinder liners. All bearings, pins, and gears receive a continuous supply of oil under pressure which is circulated through an oil cooling radiator.
- Fuel Tank:** The camshaft is hollow with separately forged steel case hardened cams, keyed in place.
- Cooling System:** The engine is fully equipped with governor, speed regulator and fuel pump.
- Air Compressor:** An auxiliary air compressor, belt driven by a gasoline engine, supplies air for starting the main engine after a long shutdown. A reservoir with piping, safety valve and gauge is connected to the compressor.
- Fuel Tank:** A fuel tank of large capacity is located at the rear of the revolving frame with suitable connections to a fuel pump on the engine. A pump is furnished for filling the fuel oil tank.
- Cooling System:** The circulating water for the engine is circulated through an independent radiator, composed of bottom, center and top tanks, to which separate interchangeable cores are bolted. These cores are built of copper of the tube and fin type. Individual cores may be removed for repair work or replacement. Independent radiator cores are provided for cooling the engine lubricating oil. The radiator is equipped with a belt driven fan mounted as a unit with the radiator and braced into the house framing and the revolving frame. A pump is furnished for filling the water system.
- Air Compressor:** An independent motor-driven compressor is provided to furnish air for the clutches and walking brake. Pumps for circulating water and oil are driven from the engine.

TRANSMISSION

- Dry Plate, Single Disc, Air Operated Clutch:** The engine drives the main machinery through a dry plate, single disc, air operated clutch, the driving member of which is attached to the engine flywheel by a flexible coupling and the driven member of the clutch is attached to transmission drive shaft. The clutch is released by a spring and engaged by air pressure, controlled at the operator's stand.
- Herringbone Gear Reduction:** The transmission consists of a herringbone gear reduction unit the output shaft of which is coupled to the machinery drive pinion shaft by a flexible coupling. All transmission gears are enclosed as a unit in a rigid case, firmly secured to the revolving frame, and all shafts turn in anti-friction bearings in such a manner as to avoid side pressure of the gear teeth. The gears run in an oil bath. Shafts are steel forgings and gears have teeth cut from solid metal.

ELECTRICAL EQUIPMENT

- Belt Driven Generator Unit:** Power for the swing motors is furnished by a generator, with a directly connected exciter, both being mounted as a unit and driven by "V" belts from the engine flywheel. The generator unit is mounted laterally so that digging vibrations are normal to the bearings.
- Swing Motors:** The swing motors have separately excited main field windings and are of a type suitable to high peak duty having small flywheel effect. They have large shafts running in roller bearings. Fireproof insulation is used throughout permitting operating at high temperatures.
- Magnetic Control:** At the operator's position is a master switch, which controls the closing and opening of magnetic contactors. These contactors vary the resistance in the generator fields, which establishes the voltage of the generator, and thereby the speed and direction of rotation of the swing motors. The generator windings are designed to limit the current in the motors to a value which will develop the maximum

torque required. The resistors, switches for auxiliary apparatus and light, and the contactors are suitably enclosed.

Power Wiring:

As far as possible all power wiring is of the multiple cable, interlocked, armor type. Exact length of cable and the addition of terminals, as far as practical, are made before shipment, thereby reducing installation in the field.

Lighting:

Current for lights is furnished by the exciter which serves as a generator, the voltage being regulated by a carbon pile regulator. For obtaining current when Diesel engine is not operating, a generator is furnished, driven by the auxiliary gasoline engine. The lights furnished include reflector type lamps on the underside of the boom at regular intervals, lights for interior and exterior of house and connections for extension cords, together with fixture and switches. As far as possible all wiring is in conduit securely attached to the machine structure.

GENERAL

The entire machine is built of sound, high grade materials throughout and in a workmanlike manner, so as to operate properly under normal use and with proper attention. Accessibility for renewal of parts without complete dismantling has been followed in the design. Special attention has been given to efficiency by elimination of excessive friction of moving parts, and provisions have been carefully made to provide for easy and efficient lubrication.

A platform is provided at the boom point to provide a sure footing for operator when lubricating and inspecting machinery parts. All structural material is in conformity with the requirements of A. S. T. M. specifications. All steel castings are of special or alloy steels and are carefully selected for the various duties they are called upon to perform. Certain steel castings, particularly those subject to heavy duty and severe stress, undergo a special electric heat treatment to give the desired qualities.

All parts of the machine are well painted in a neat manner before shipment. No oil or material used on the machine and subject to consumption during operation is furnished by Bucyrus-Monighan Company.

It is the policy of Bucyrus-Monighan Company to improve its products continually. The right is reserved to make modifications or design which, in the opinion of this Company are in accord with this policy, or which are necessary because of the unavailability of materials. These specifications are for the purpose of identifying the exact type of machine sold, and do not limit or extend the express warranty contained in the contract of sale.

END OF SPECIFICATION

BUCYRUS-MONIGHAN COMPANY MODEL 7-W DRAGLINE EXCAVATOR

DIESEL ENGINE DRIVEN SPECIFICATIONS

*Net weight, domestic, approximate.....	567,000 lbs.
Working weight, approximate.....	692,000 lbs.
Ballast required, furnished by purchaser, maximum (varies with boom length).....	120,000 lbs.
Shipping weight, prepared for export, approximate.....	592,000 lbs.
Ships option tons.....	550

*Add 10,000 lbs. blocking on cars when estimating freight for domestic delivery.

Walking Traction Mounting:

Width and length of shoes.....	5'-0"x27'-0"
Area of both shoes.....	270 sq. ft.
Diameter of cam.....	5'-4"
Length of step.....	7'-6"
Overall width over shoes.....	37'-7"
Diameter of walking shaft.....	13" (at ends 15")
Walking speed, normal to engine speed.....	0.20 mi. per hr.

Base:

Outside diameter.....	26'-0"
Bearing area.....	531 sq. ft.
Diameter of rail circle.....	25'-5"
Weight of roller rail per yard.....	6"—175 lbs.
Number and diameter of rollers.....	52—9"
Pitch diameter swing rack.....	21'-4"

Revolving Frame:

Width and length.....	18'-0"x41'-9"
Depth outside sill members.....	6'-6"
Depth inside sill members.....	6'-6"

Machinery:

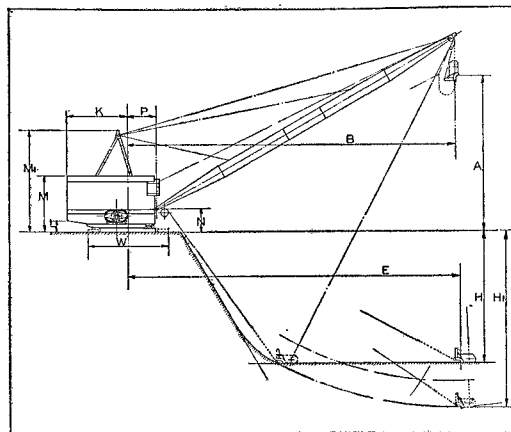
	140' Boom	160' Boom	180' Boom
Hoist drum, grooved.....	36" P. D.	36" P. D.	40" P. D.
Speed of hoist rope, 1 pt. (average bucket and load)	216 f.p.m.	216 f.p.m.	240 f.p.m.
Drag drum, grooved.....	36" P. D.	36" P. D.	40" P. D.
Speed of drag rope (average digging pull)...	170 f.p.m.	170 f.p.m.	189 f.p.m.
Dia. of hoist rope, 1 pt....	1½"	1¼"	1¼"
Dia. of drag rope.....	1¾"	1½"	1½"
Dia. of boom hoist rope, 10 pt.....	1⅛"	1⅛"	1⅛"
Boom speeds are standard for drums shown.			
Boom point sheave, hoist rope.....			39" P. Dia.

Engine:

Make—Cooper-Bessemer GS-6-D—6 cylinder.	
Bore and stroke.....	10½"x13½"
Normal speed.....	525 r.p.m.
Horsepower rating (Excavating service).....	435
Horsepower rating (Continuous).....	390
Capacity of fuel tank.....	800 U. S. Gals.
Capacity of water cooling tank.....	100 U. S. Gals.

Electric Equipment:

Swing motors.....	2—40 H. P. ea., 230 v. 75° C. Cont.
Swing generator—W. L. control....	Capacity to suit motor.

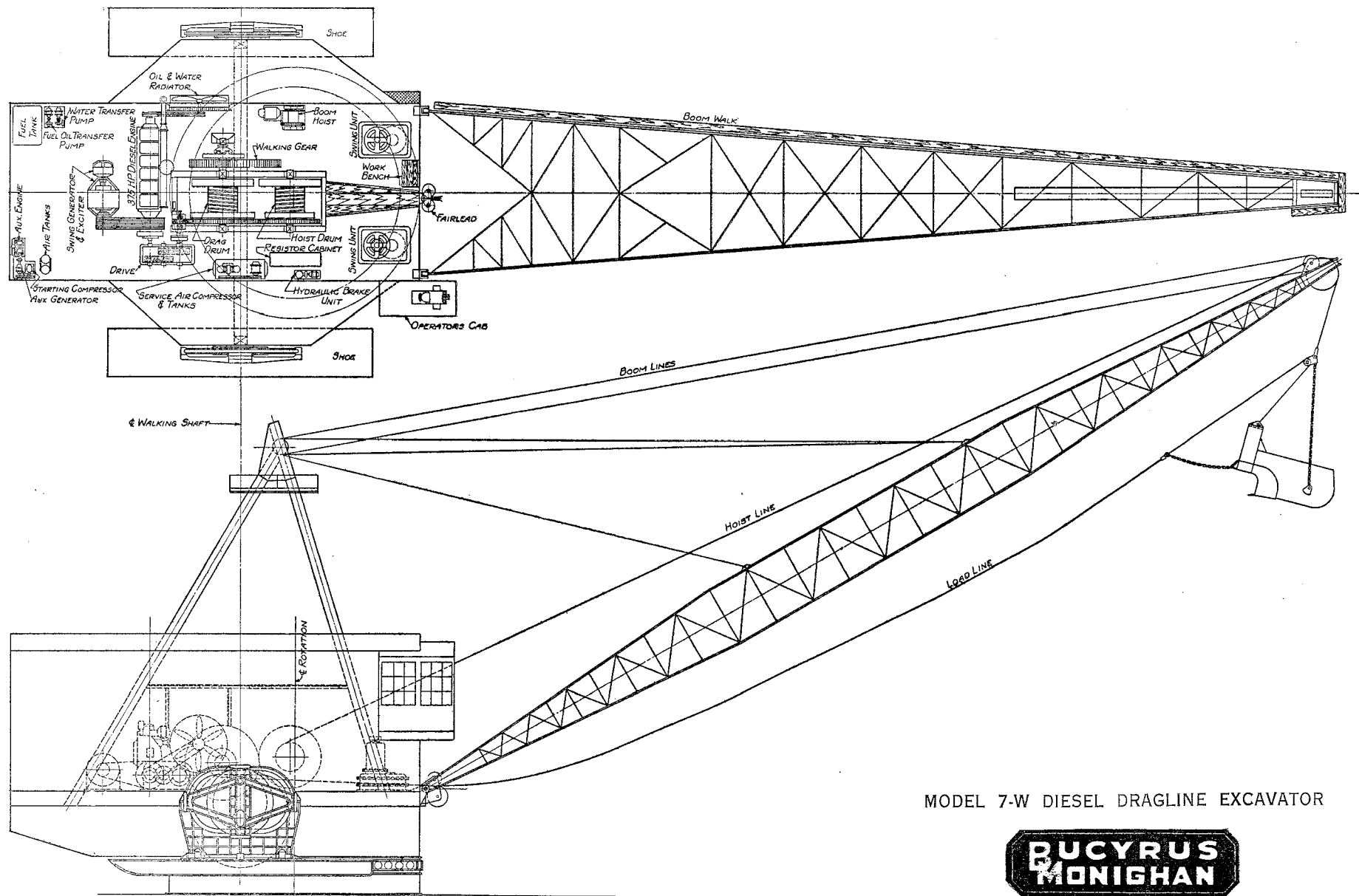


WORKING RANGES

(Capacity of buckets figured with contents weighing 3,000 lbs. per cu. yd.)

(Digging depth varies with character of material)

Length of Boom.....	140'-0"			160'-0"			180'-0"		
	36,500			30,000			26,500		
Maximum Allowable Load, lbs.....	7 cu. yd. Type AX			6 cu. yd. Type AX			5 cu. yd. Type AX		
Capacity and Type bucket, Ordinary work.....									
Angle of boom.....	25°	30°	35°	25°	30°	35°	25°	30°	35°
Dumping height with bucket shown.....	51'-0"	61'-0"	71'-0"	60'-0"	73'-0"	84'-0"	70'-0"	84'-0"	97'-0"
Dumping reach.....	143'-0"	136'-0"	129'-0"	160'-0"	153'-0"	146'-0"	178'-0"	170'-0"	162'-0"
Digging reach, under boom point.....	147'-0"	140'-0"	133'-0"	164'-0"	157'-0"	150'-0"	182'-0"	174'-0"	166'-0"
Digging depth, favorable conditions.....	96'-0"	85'-0"	74'-0"	108'-0"	95'-0"	82'-0"	125'-0"	110'-0"	95'-0"
Depth bucket can be lowered under boom point, std. ropes.....	102'-0"	93'-0"	84'-0"	117'-0"	106'-0"	95'-0"	131'-0"	120'-0"	107'-0"
Clearance radius of revolving frame.....	K			30'-5"					
Clearance under frame to ground, average.....	L			5'-0"					
Height of house.....	M			26'-6"					
Height of A-frame.....	M1			48'-6"					
Height of boom foot pin above ground.....	N			10'-8"					
Distance boom foot pin to center rotation.....	P			13'-3"					
Overall width of walking shoes.....	W			37'-7"					
Clearance radius of shoes.....				26'-9"					



MODEL 7-W DIESEL DRAGLINE EXCAVATOR

**BUCYRUS
MONIGHAN**

BUCYRUS-MONIGHAN COMPANY

CHICAGO, ILL. U. S. A.

SPECIFICATION OF A SPECIAL 9-W DRAGLINE EXCAVATOR DIESEL DRIVEN

Bucket.....Cu. Yds.

Boom.....Ft. Long

The following specifications cover a Model 9-W Dragline Excavator equipped with walking traction mounting and arranged to operate from a Diesel engine power plant. The machine is to be equipped with boom and drag bucket as specified by the purchaser and selected from available combinations.

WALKING TRACTION MOUNTING

Self-Contained
Traction Unit:

The machine will be mounted on a self-contained, walking traction mounting composed of three major parts each side of the revolving frame, consisting of an eccentric cam, elongated track frame and shoe.

Positive Walking
Motion:

The cam is an alloy steel casting having a concave shaped face to engage the track and is square bored to fit the walker shaft.

Longitudinal and
Lateral Oscillations
of Shoes:

Fitted into the cam is a crank pin carrying a roller, located in a position diametrically opposite the walking shaft, at a distance which determines the length of the step of the walking traction. The cam is located within the track frame which is made in two halves bolted together and braced by two "T" shaped castings, bolted to the track frame castings, and forming a guide for the cam roller. The track frame is an alloy steel casting having a convex track section for the cam. The lower half has a rounded face which rests in a concave bearing on the shoe. The frame is held to the shoe by caps fitting over rounded sections cast integral in each end of the lower frame casting. This construction allows the shoe to swivel on the track frame to adjust its bearing to irregular ground conditions.

Shoes Rigid
Structural Units:

The shoes are made of longitudinal I-beam members braced by cross members to form a box construction. The lower face is curved upward at the ends to provide a climbing angle and the shoe is entirely plated on the top and bottom. Cleats across the bottom of the shoe prevent skidding during the walking motion.

Anti-Skid Cleats:

WALKING SHAFT AND DRIVE

Simple Drive
Machinery:

The walking operation is accomplished through the simultaneous placing of the shoes on the ground and tilting and skidding the entire machine and its base on the ground. This operation is accomplished by the cams turning in the track guides on the shoes.

Shoes Held High
Above Ground
During Digging
Operation:

The cams are carried at the ends of a large diameter steel forged walking shaft which extends across the revolving frame. This shaft is located ahead of the center of gravity of the machine when traveling to provide proper weight distribution and is supported in special large bearings in a tower framing at each side of the revolving frame. Additional bearings are provided where required to give adequate support for the shaft. These bearings have renewable bronze bushings and are connected to the trussed revolving frame.

Upset Square
Section of Shaft
in Cams and Gear:

The shaft has an upset square section at each end for the cams and for the gear which is located at the main machinery. The shaft is driven through this gear meshing with a pinion on the extended drag drum shaft. This pinion is engaged by a positive jaw clutch operated by a double acting air thrust cylinder controlled from the operator's station. The pinion is combined with a large diameter brake housing carrying an outside band brake of large diameter and wide face. This brake is spring set and is released by an air cylinder controlled by the operator. The brake is used to hold the shoes off the ground when the machine is digging and swinging.

Large Diameter
Brake; Spring Set
and Air Released:

BASE

Rigid Structure
to Support Machine:

The machine is mounted on a circular structural steel base, on which are mounted the swing rack, segment castings and the rail for the turntable rollers.

The base consists of inner and outer concentric I-beams bent to circular form, braced by cross I-beams securely tied to the outer circle beam and to each other. Between these cross beams are diagonal beams which form the support for the swing rack segments, and which beams are braced to the outside circle beam by radial beams. The outer circle rail is supported and attached to the inner circle beam. The entire base is covered on the bottom with a heavy steel plating, reinforced by a heavy, circular plate extending inward from the outer edge of the base to provide a wearing surface for the main plate. The top of the base is also covered with plates, which have covered openings providing access to each structural division. To facilitate shipment the base is made in sections and is assembled in the field.

Center Castings:

At the center of the base is the center casting which is carefully fitted and securely attached to the cross members. This casting fits into the revolving frame center casting, centering the machine. Adjustment and tying together of the two frames is by means of a threaded collar on the base center casting pintle.

Steel Casting
Swing Racks:

The swing racks are steel casting segments with outside teeth of large pitch, and are firmly bolted together and to the structural support members of the base. The roller rail is of heavy section, and is securely attached to the base.

Roller Rail:

ROLLER CIRCLE

Roller Loads	The roller circle consists of a large number of forged steel, single tread double flanged rollers revolving between two single rail circles, one attached to the bottom of the revolving frame and the other to the top of the circular base.
Widely Distributed:	The roller frame is composed of two bars, one on the inside and one on the outside, both being rolled to circular form, and separated by large diameter pins on which the rollers are spaced. Means of lubricating the rollers are provided on each roller pin.
REVOLVING FRAME	
Structural Framing:	The revolving frame is composed of multiple heavy I-beam members riveted together with large corner angles. The two longitudinal outside sills are deep box section bridge type girders, and these two sills are spaced and tied together at the front and rear by box section, bridge type girders. The side girders are spaced and tied together by transverse I-beams between which are longitudinal I-beams to provide substantial supports for the machinery and for the full circle revolving frame roller rail. The entire frame is plated on top and bottom to add rigidity to the entire unit.
Outside Sills	Built into each outside girder sill is a truss construction composed of upright and diagonal members tied together with large gussets. The forward and rear diagonals are extended high above the revolving frame to form the outside members of the A-frame. The entire truss and A-frame construction is rigidly braced by horizontal chord members and diagonal bracing. The side trusses are separated and tied together by transverse members and by diagonal bracing in a horizontal plane. At the front and rear the side trusses are braced by transverse trusses. Built into the truss and substantially tied and braced to the revolving frame, are the two walking shaft tower structures built of plate and angle girders. These towers carry the main outboard bearings for the walking shaft, which are large bronze bushed, steel castings, securely attached to the structures.
Bridge Type	
Box Girders:	
Full Circle	
Roller Rail:	
Truss and A-frame Structure:	The revolving frame, tower structures, truss and A-frame are thoroughly braced and tied together to form a rigid unit to withstand the loads imposed due to digging and walking motions. The cross bracing for the truss carries a track with a crane having longitudinal and transverse travel to facilitate removal of machinery parts. Means are provided for attaching a chain block, but no chain block is furnished. Attached to the underside of the revolving frame diametrically opposite the front end of the frame, are two hooks, spaced each side of the longitudinal center of frame. These hooks engage the upper flange of the full depth base beam. They relieve the center pintle when tilting the base during the walking motion.
Girder Type Tower Structure:	
Entire Frame a Rigid Structural Unit:	
Overhead Crane:	
Lifting Hooks	
Relieve Center	
Bearing Loads:	

MAIN MACHINERY

Single-Part Hoist; Single-Part Drag Rope:	The main machinery is designed to handle the hoisting of the bucket on a single-part hoist and the digging of the bucket on a single-part rope. The hoist rope leads from the drum over the boom point sheave and is attached direct to the bucket hoist bail. The drag rope leads from the drum, through the fairlead, directly to the digging bail of the bucket.
Machinery Mounted as Unit on Frame:	The main machinery is constructed in a unit, which is attached to the revolving frame center sills. The bearings for the shafts are contained in unit steel side frames, and have renewable bronze shells.
Simple Machinery:	The machinery consists of a hoist drum shaft and drag drum shaft. The drag drum shaft is driven by the transmission pinion meshing with the drag drum shaft gear and the drag gear meshes with the hoist drum gear.
Unit Drum Assembly:	The hoist and drag drums are each composed of the barrel, the brake housing and the friction housing. These housings have bronze bushed hubs running free on the shaft, and the drum barrel, made in two halves, is clamped between them by large bolts. The hoist and drag drum gears are fixed to their shafts.
Air Operated Friction Clutches:	The friction clutches are of the outside band type, of large diameter and wide face, and are lined with moulded asbestos blocks. These clutches are operated by air cylinders attached to the arms of the gears, the air to the cylinders being controlled by electrically operated valves.
Large Diameter, Wide Face Brakes:	The brakes are of the outside band type, of large diameter, and wide face, and are lined with moulded asbestos blocks. The brakes are power operated by foot pedals at the operator's stand. The drag drum shaft is extended to carry the pinion which drives the walking shaft. This pinion is bronze bushed and is free on the shaft, being engaged by a jaw clutch sliding on the shaft, operated by a double acting air cylinder controlled from the operator's stand. An outboard bearing is provided for the extended drag drum shaft.
Forged Shafts, Cut Gear Teeth:	All shafts are steel forgings, and all gears have teeth cut from the solid metal.

SWING MACHINERY

Two Vertical Units:	Two swing machinery units are mounted on opposite sides of the revolving frame.
Gears Enclosed:	Each unit consists of a vertical motor driving through enclosed spur gear reductions to the vertical rack pinion shaft, and a spur pinion at lower end of this shaft engages the swing rack on the base. All spur gears have teeth cut from solid metal. The rack pinion is an alloy casting with cast teeth to mesh with the cast teeth of the rack. All shafts are hammered steel forgings and all bearings are of anti-friction type except those for the rack pinion shaft which are bronze bushed.
Swing Brakes:	The motor of each swing unit is provided with a brake which is spring set and air released. The brake is automatically applied in the event of electric power failure or may be applied by the operator through a switch.

DRAGLINE FAIRLEAD

Universal Fairlead:	A universal fairlead for the drag rope is mounted on the front girder of the revolving frame. It is composed of two horizontal and two vertical sheaves mounted on shafts running in bearings in a swivel frame, which is free to swing laterally in line with the lead of the drag rope from the position of the bucket. The sheaves are of alloy steel.
Sheaves Mounted in Swivel Frame:	Renewable cast guards for leading the rope onto the sheaves are fastened to the swivel frame.

BOOM

- Welded Construction:** The boom is of welded construction, composed of four T-shaped chord members, latticed on four sides with tubular members. The lower end is provided with plate foot construction, attached to the chord members.
- Swivel Point Sheave on Roller Bearing:** Attachments for the boom suspension sheaves are provided at the upper end of the boom. The bucket hoisting sheave is an alloy steel casting with machined groove, mounted on a roller bearing and enclosed in a swivel frame, providing the proper lead for the rope to the bucket.

BOOM SUSPENSION

- Independent Motor Driven Drum:** The boom is raised and suspended by a suspension tackle, operated by a self-contained, motor driven, worm-gear drum. The boom hoist is constructed as a unit and is mounted on the right side of the revolving frame approximately in line with the rotating center of the machine. The motor is reversible and is locally operated, power being provided by the exciter.

BUCKET

- Selected to Suit Work:** A dragline bucket of the size and type specified will be furnished. The bucket is constructed to withstand the duty for which it is intended and will have good digging and filling qualities. Hoisting and digging bails of chain and a dump rope and sheave are furnished with the bucket.

OPERATING LEVERS

- Arranged for Easy Operation and Clear View of Work:** The operating levers are located at the forward end of the revolving frame, to the right of the boom, on a platform raised above the floor of the frame, giving the operator a clear, unobstructed view of the work. The hoist and drag brakes are operated by foot treadles.

ROPES

- Complete Rope Equipment:** A complete set of ropes for the machine is supplied consisting of the hoist, drag and boom hoist ropes.

BALLAST

- Furnished by Purchaser:** Space is provided in the revolving frame for the required amount of ballast, which will be furnished by the purchaser. Steel punchings or scrap are suitable for this purpose.

TOOLS

- Tools Furnished:** A suitable assortment of tools is furnished, composed of an Alemite gun, a complete set of wrenches, hammer, vise, and oil cans.

HOUSE

- All Steel Construction, Paneled Sides:** The house is constructed entirely of steel, with paneled sides attached to steel arch truss frames to facilitate erection in the field. The steel roof covers the entire revolving frame. Doors and windows are provided where necessary. The front of the machine is enclosed and provided with large windows in front of the operator's stand.

POWER PLANT

- Vertical Mechanical Injection, Full Diesel Engine:** The power for driving the machine is furnished by a multiple cylinder, four cycle, vertical type, mechanical injection, full Diesel engine, constructed to meet the requirements of excavating machine service. All moving parts of the engine except the flywheel are enclosed.
- Moving Parts Enclosed:** The cylinders are provided with renewable liners and water jackets of liberal size. The cylinder liner joints are sealed water tight by round rubber grommets held in turned recesses. The heads contain the air starting valve and fuel nozzles, relief valve, intake and exhaust valves.
- Long Pistons:** The pistons are made long in proportion to diameter to minimize wear from angular thrust, are constructed so that an unbroken surface is in contact with the cylinder wall. The wrist pin is housed on the inside of the piston. The connecting rods are of the solid forged type having upper end forged integral and the lower end of the split box type.
- Force Feed, Continuous Lubrication:** The base forms the main bearing supports. The cylinder block is of box construction and carries the removable cylinder liners. All bearings, pins, and gears receive a continuous supply of oil under pressure which is circulated through an oil cooling radiator.
- Starting Air Compressor Unit:** The cam shaft is hollow with separately forged steel case hardened cams, keyed in place. The engine is fully equipped with governor, speed regulator and fuel pump. An auxiliary air compressor, belt driven by a gasoline engine, supplies air for starting the main engine after a long shutdown. A reservoir with piping, safety valve and gauge is connected to the compressor.
- Large Fuel Tank:** A fuel tank of large capacity is located at the rear of the revolving frame with suitable connections to a fuel pump on the engine. A pump is furnished for filling the fuel oil tank.
- Independent Radiators:** The circulating water for the engine is circulated through independent radiators, composed of bottom, center and top tanks, to which separate interchangeable cores are bolted. These cores are built of copper of the tube and fin type. Individual cores may be removed for repair work or replacement. An independent radiator is provided for cooling the engine lubricating oil. The radiators are equipped with individual motor driven fans mounted as a unit with the radiators and braced into the house framing and the revolving frame.
- Large Water Tank:** A large capacity water tank is furnished, located at the rear of the revolving frame to increase the water volume within the circulating system of the engine. A pump is furnished for filling the water system.
- Independent Compressor:** An independent motor-driven compressor is provided to furnish air for the clutches and brakes. Pumps for circulating water and oil are motor driven.

TRANSMISSION

- "Airflex" Clutch:** The engine drives the main machinery through an "Airflex" clutch, the driving member of which is attached to the engine flywheel and the driven member of the clutch is attached to the transmission drive shaft. The clutch is controlled at the operator's stand.
- Herringbone Reduction Enclosed in Oil Bath:** The transmission consists of a herringbone reduction unit, the output shaft of which is coupled to the hoist drive pinion shaft by a flexible coupling. All transmission gears are enclosed as a unit in a rigid case, firmly secured to the revolving frame, and all shafts are mounted on anti-friction bearings in such a manner as to avoid side pressure of the gear teeth. The gears run in an oil bath.
- Shafts are steel forgings and gears have teeth cut from solid metal.

ELECTRICAL EQUIPMENT

- Belt Driven Generator and Exciter Unit:** Power for the swing motor is furnished by a generator, with a directly connected exciter, both being mounted as a unit and driven by "V" belts from the engine flywheel. The generator unit is mounted laterally so that digging vibrations are normal to the bearings.
- Motor Rugged, Roller Bearing Small Flywheel Effect:** The swing motors have separately excited main field windings and are of a type suitable to high peak duty having small flywheel effect. Each motor has a large shaft running in roller bearings. Class "B" insulation is used throughout permitting operation at high temperatures.
- Simple, Magnetic Control:** At the operator's position are master switches, which control the closing and opening of magnetic contactors. These contactors vary the resistance in the generator fields, which establishes the voltage of the generator, and thereby the speed and direction of rotation of the motors. The generator windings are designed to limit the current in the motors to a value which will develop the maximum torque required. The resistors, switches for auxiliary apparatus and lights, and the contactors are suitably enclosed.
- Separately Excited Fields Affording Smooth Operation:** As far as possible, all power wiring is of the multiple cable, interlocked, armor type. Exact length of cable and the addition of terminals, as far as practical, are made before shipment, thereby reducing installation in the field.
- Armored Cable Wiring:** Current for lights is furnished by the exciter which serves as a generator, the voltage being regulated by a carbon pile regulator. For obtaining current when Diesel engine is not operating, a generator is furnished, driven by the auxiliary compressor gasoline engine. The lights furnished include reflector type lamps on the underside of the boom at regular intervals, lights for interior and exterior of house and connections for extension cords, together with fixtures and switches. As far as possible all wiring is in conduit securely attached to the machine structure.
- Lighting:**

GENERAL

The entire machine is built of sound, high grade materials throughout and in a workmanlike manner, so as to operate properly under normal use and with proper attention. Accessibility for renewal of parts without complete dismantling has been followed in the design. Special attention has been given to efficiency by elimination of excessive friction of moving parts, and provisions have been carefully made to provide for easy and efficient lubrication.

A platform is provided at the boom point to provide a sure footing for operator when lubricating and inspecting machinery parts.

All structural material is in conformity with the requirements of A. S. T. M. specifications. All steel castings are of special or alloy steels and are carefully selected for the various duties they are called upon to perform. Certain steel castings, particularly those subject to heavy duty and severe stress, undergo a special electric heat treatment to give the desired qualities.

All parts of the machine are well painted in a neat manner before shipment. No oil or material used on the machine and subject to consumption during operation is furnished by Bucyrus-Monighan Company.

It is the policy of Bucyrus-Monighan Company to improve its products continually. The right is reserved to make changes in specifications or design which, in the opinion of this Company, are in accord with this policy, or which are necessary because of the unavailability of materials. These specifications are for the purpose of identifying the exact type of machine sold, and do not limit or extend the express warranty contained in the contract of sale.

End of Specification.

BUCYRUS-MONIGHAN COMPANY

SPECIAL 9-W DRAGLINE EXCAVATOR

DIESEL ENGINE DRIVEN

SPECIFICATIONS

*Net weight, domestic, approximate.....	1,095,000 lbs.
Working weight, approximate.....	1,240,000 lbs.
Ballast required, furnished by purchaser.....	140,000 lbs.
Shipping weight, prepared for export, approximate.....	1,128,000 lbs.
Ships option tons.....	840

*Add 12,000 lbs. blocking on cars when estimating freight for domestic delivery.

Walking Traction Mounting:

Width and length of shoes	6'-0"x42'-6"
Depth of shoes	2'-0"
Bearing area of both shoes	480 sq. ft.
Diameter of cam	6'-10"
Length of step	8'-0"
Overall width over shoes	49'-6"
Diameter of walking shaft	18"
Walking speed, normal engine speed	0.19 mi. per hr.

Base:

Outside diameter	36'-0"
Bearing area	1018 sq. ft.
Diameter of rail circle, single rail	30'-0"
Size of roller rail	6"—175 lbs.
Number and diameter of rollers	88—10"
Pitch diameter swing rack	23'-9½"
Diameter of center pintle	14"

Revolving Frame:

Width and length	26'-7"x50'-1½"
Depth outside sill members	33" box girders
Depth inside sill members	33" I-Beams

Machinery:

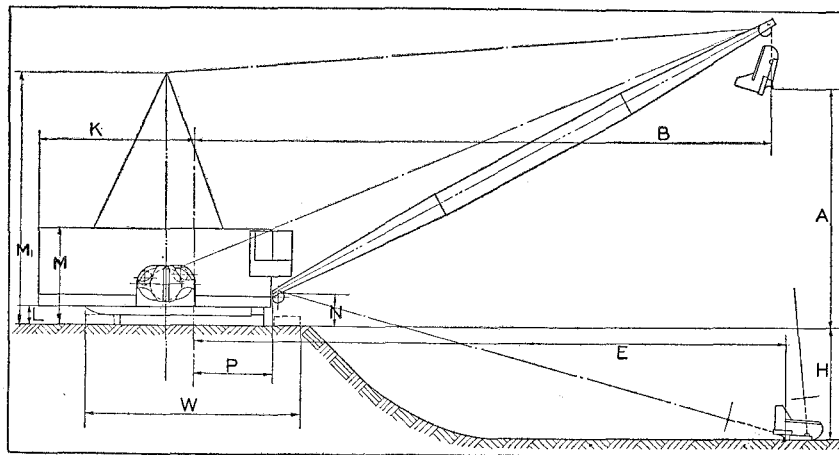
	165' Boom	183' Boom	200' Boom
Hoist drum, grooved.....	42½" P.D.	45½" P.D.	48" P.D.
Speed of hoist rope, 1 pt. (aver. bucket and load).....	200 f.p.m.	210 f.p.m.	226 f.p.m.
Drag drum, grooved.....	42½" P.D.	45½" P.D.	48" P.D.
Speed of drag rope (average digging pull).....	178 f.p.m.	190 f.p.m.	202 f.p.m.
Dia. of hoist rope, 1 pt.....	1¼"	1½"	1½"
Dia. of drag rope	2⅞"	2"	2"
Dia. of boom hoist rope, 14 pt.	1½"	1½"	1½"
Rope speeds are standard for drums shown			
Hoist rope sheave, boom point	54" P.D.		

Engine:

Make—Cooper-Bessemer, JS-8 — 8 cylinder — 4 cycle.	
Bore and stroke	13"x16"
Normal speed	450 r.p.m.
Horsepower rating (Excavator service)	850
Horsepower rating (Continuous)	775
Capacity of fuel tank	1,180 U. S. Gals.
Capacity of water tank	200 U. S. Gals.

Electrical Equipment:

Swing motors (blown).....	2—75 H.P. ea., 230 v. 75° C. Cont.
Swing generator—W.L. control.....	Capacity to suit motor



WORKING RANGES

(Capacity of buckets figured with contents weighing 3,000 lbs. per cu. yd.)
(Digging depth varies with character of material)

Length of Boom.....	165'-0"			183'-0"			200'-0"		
Maximum Allowable Load, lbs.....	52,000			46,000			42,000		
Capacity and Type bucket, Ordinary work.....	10 cu. yd. Type AX			9 cu. yd. Type AX			8 cu. yd. Type AX		
Angle of boom.....	25°	30°	35°	25°	30°	35°	25°	30°	35°
Dumping height with bucket shown.....	A	A	A	A	A	A	A	A	A
Dumping reach.....	B	B	B	B	B	B	B	B	B
Digging reach, under boom point.....	E	E	E	E	E	E	E	E	E
Digging depth, favorable conditions.....	H	H	H	H	H	H	H	H	H
Depth bucket can be lowered under boom point, std. ropes.....	H1	H1	H1	H1	H1	H1	H1	H1	H1
Clearance radius of revolving frame.....	K			K			K		
Clearance under frame to ground.....	L			L			L		
Height of house.....	M			M			M		
Height of A-frame.....	M1			M1			M1		
Height of boom foot pin above ground.....	N			N			N		
Distance boom foot pin to center rotation.....	P			P			P		
Overall width of walking shoes.....	W			W			W		
Clearance radius of shoes.....	W			W			W		