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WAR DEPARTM

MAINTENANCE MANUAL AND PARTS CATALOG

SHOVEL, POWER, CRAWLER MOUNTED, GASOLINE ½ CU. YD. MODEL 15-B

BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WIS.
JAN. 13, 1943

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WAR DEPARTMENT

TM5-1170, Maintenance Manual and Parts Catalog, Shovel, Power, Crawler-Mounted, Gasoline, ½ Cu. Yd., Mdl 15-B, published by the Bucyrus-Erie Co., is furnished for the information and guidance of all concerned.

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Chief of Staff.

Official:
J. A. ULIO,
Major General,
The Adjutant General.

SGV TD

OPERATORS' MANUAL

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Bucyrus-Erie 15-B

On the front cardboard cover of each of the three books bound together in this volume is a convenient table of contents, numbered and positioned to key in with the tabs on the right margin of each of the right-hand pages. By bending the book back you can easily locate any desired section.

1 INTRODUCTION Pages 1 to 13

2 SPECIFICATIONS Pages 14 to 19

3 GENERAL DRAWINGS Pages 20 to 31

4 OPERATING Pages 32 to 59

5 LUBRICATION Pages 60 to 91

6 COOLING Pages 92 to 95

7 LUBE CHART Pages 97 and 98

8 ADJUSTMENTS Pages 99 to 113

9 CONVERSION Pages 114 to 123

10 REEVING Pages 124 to 131

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BUCYRUS ERIE

15-B TRAINING MANUAL

TM5-1170

This book has been published for Bucyrus-Erie 15-B Excavators with the following Machine Serial Numbers:

24085 to 24207 inclusive—War Dept. Purchase Order 55954
27400 to 27840 inclusive—War Dept. Purchase Order C-2774
29740 to 29987 inclusive—War Dept. Purchase Order PI-2813

This manual has been prepared for the United States Army Engineers to assist in obtaining efficient operation, maximum production, and economical maintenance for their Bucyrus-Erie 15-B excavators.

Illustrations and drawings throughout the book cover specifically current machines now being built, but apply in general to any Bucyrus-Erie 15-B.

We should like to call your attention to the special steels and treatments such as special heat treating, annealing, carburization, flame hardening, etc., which have been applied to various 15-B parts to increase the speed and ease of operation, and to reduce wear and maintenance. These do not show in the drawings or pictures, but it is especially important that, when replacement of parts may become necessary, genuine Bucyrus-Erie repair parts be used.

OPERATORS' MANUAL

Before operating the 15-B, we suggest that even the experienced operator review the entire contents of the three instruction manuals (Operators' Manual, Maintenance Manual and Parts List). While this material has had to be prepared in sufficient detail and simplicity to be of maximum help to the beginning operator, the old-timer will also find in it information, illustrations and drawings of considerable interest. His familiarity with this material will make it easier for him to instruct and supervise his associates and assistants in details of 15-B operation and maintenance.

Included in this volume, in addition to the OPERATORS' MANUAL, are two additional books; the MAINTENANCE MANUAL and the PARTS LIST. Illustrations (especially the exploded views in the Parts List) and information in these sections will be found of considerable assistance in better understanding the machine. The arrangement of the material throughout has been, as far as is possible, kept in similar order for convenience in locating supplementary information. In general, the machinery is covered from the cats* up through the revolving-frame, then the engine, transmission, and main machinery, with the front-ends at the end of the section.

Engine and Light Plant are discussed in detail in separate books prepared by the manufacturers of this equipment.

*Cats: Caterpillar-type mounting, also sometimes called crawler or corduroy mounting.

FIGURE 1

Front-end equipment is interchangeable making the 15-B a varied purpose machine to handle various types of excavating and material handling most efficiently. This illustration shows the shovel front end.

TO THE OPERATOR

A good operator studies his machine, learns its capacities and limitations, knows how and when to take care of it, and always keeps it in top operating condition. This book is to help you in that job.

You will find that the 15-B has many features that make it both easy to operate and easy to keep in good operating condition. Convenient, easy-working levers; widespread use of anti-friction bearings; oil-enclosed gears; simplicity of operating adjustments; convenient grouping of lubrication fittings...these and other refinements of design and construction help the operator do a good job. They can do no more than help, however; in the last analysis the machine is no better than its operator.

Basically, the machine has three functions:

1. To dig (or lift) material.
2. To transport it (swing).
3. To place it (dump or placement).

Self-propelling, the machine moves on two endless tread belts similar to those on tractors or tanks.

The 15-B, mounted on cats, is built for use as a

Shovel
Dragline
Dragshovel
Lifting Crane
Clamshell
Magnet Crane or
Piledriver

It may also be supplied as a transit crane, with wheel mounting instead of cat mounting and used with any of the above front ends. Each machine supplied on the contract for which this book was prepared, is equipped for use as a shovel, dragline, lifting crane, clamshell and piledriver.

FIGURE 2
BASIC MOTIONS
OF A SHOVEL

S H O V E L

The front-end equipment of a power shovel consists of a dipper on a handle (or dipper-stick) which operates from a boom. In the digging motion, the dipper is thrust away from the machine and raised above the level on which the excavator stands.

How It Works

Four basic motions comprise the shovel digging-cycle:

1. Hoist -- raising and lowering the dipper.
2. Crowd -- thrusting and retracting the dipper.
3. Swing -- swinging dipper between digging and dumping points.
4. Dump -- opening door in dipper-bottom.

A skilled operator combines these motions into a smooth fast cycle. He hoists and crowds simultaneously, and in just the right proportions to fill the dipper in the shortest time. He starts to swing as soon as the dipper is out of the bank, hoists and crowds the dipper into dumping position as he swings, starts to dump before the swing is quite finished, and lowers the dipper as he swings it back to the digging point. The 15-B is so designed and built that the operator can combine motions smoothly and without undue strain or fatigue.

Where to Use It

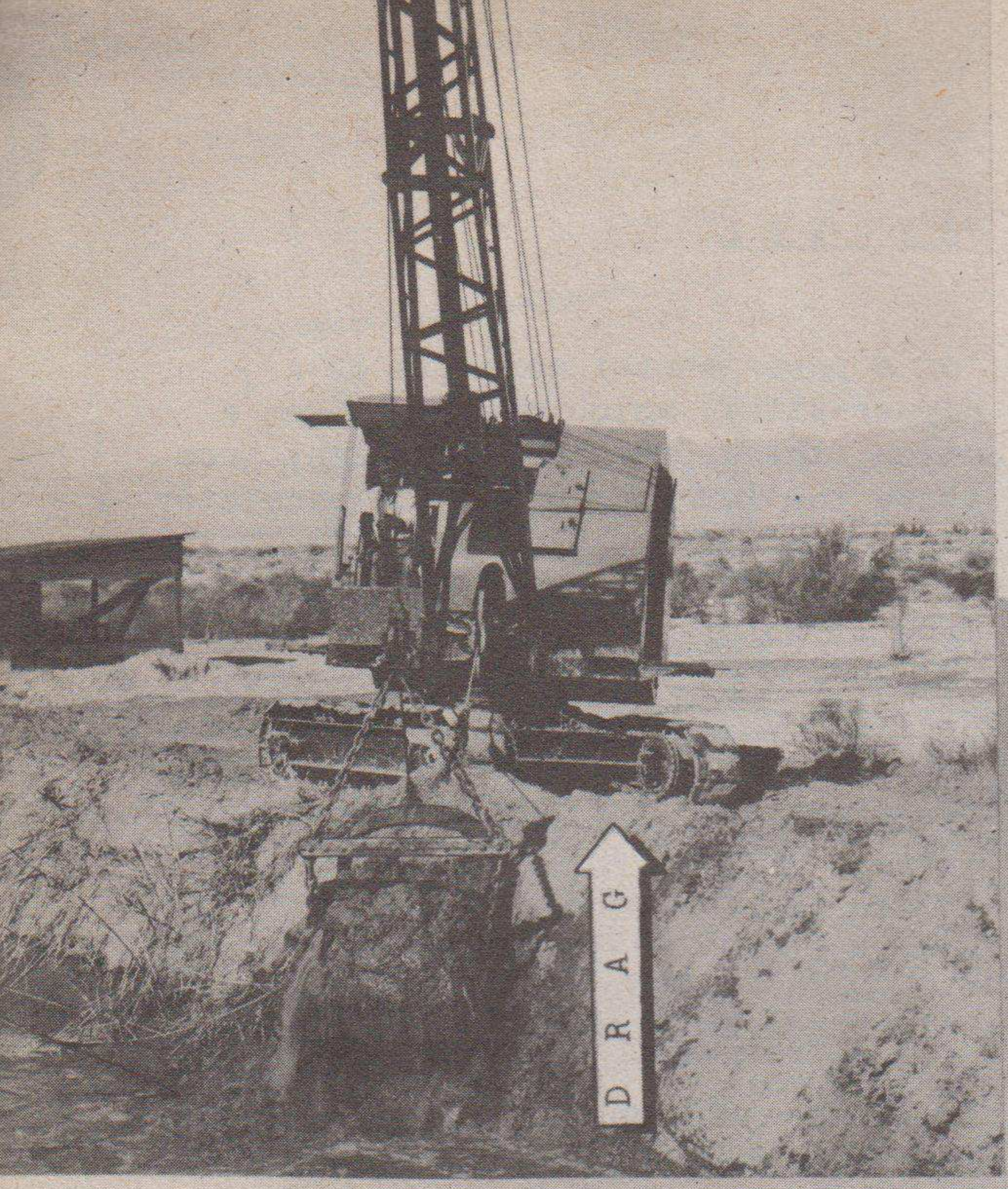
The shovel has the shortest cycle of any of the 15-B's front-end adaptations, consequently it will produce the greatest output where conditions permit the "out-and-up" digging motion.

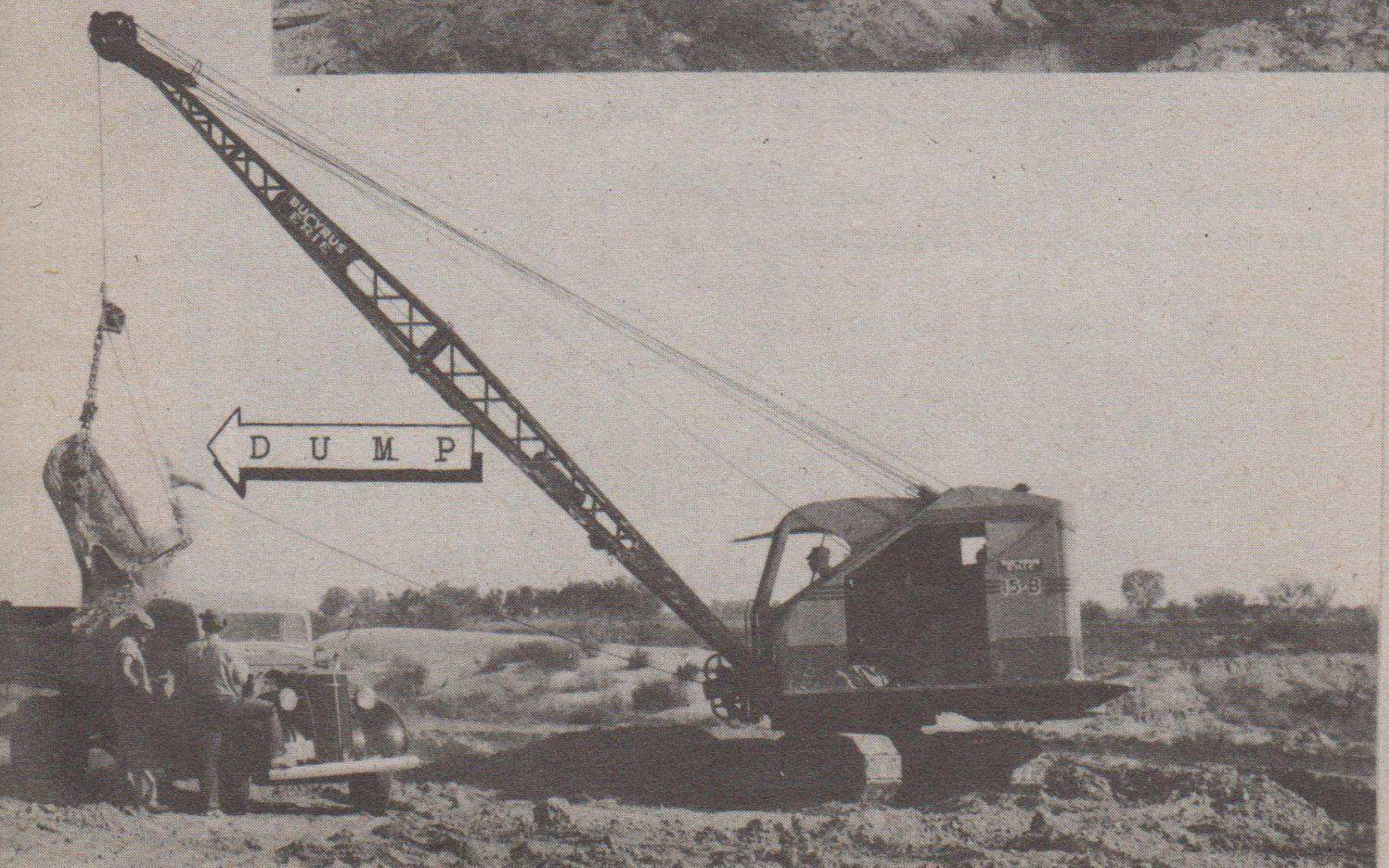
In contrast to the other front-ends, the shovel can be used to greatest relative advantage where:

1. Material to be dug is relatively hard.
2. Digging and dumping points can be close together.
3. Accurate dumping is required.
4. Dumping point is above but not too far above machine level.
5. Excavation is large enough to allow machine to be worked in it.

Rule of thumb: Use shovel front-end wherever you can.

FIGURE 3
BASIC MOTIONS
OF A DRAGLINE





D R A G L I N E

The dragline principle is similar to that of the old-fashioned horse-drawn scraper pan. The pan, or drag-bucket, is drawn toward the machine, and usually digs below the level on which it stands. The bucket is suspended by wire rope from a long lattice-type boom.

How it Works

The four main dragline operating motions are:

1. Drag -- pulling bucket through material to fill, and controlling dump.
2. Hoist -- lifting bucket from digging to dumping height and helping control filling.
3. Swing -- swinging bucket between digging and dumping points.
4. Dump -- slackening drag-rope tips bucket vertically.

A good operator will combine motions into a smooth cycle. Since control of the bucket is not through a rigid handle as with the shovel, even greater skill is required to put the bucket just where desired for digging and dumping. The digging teeth in the bucket are set at such an angle that they tend to penetrate the ground when pull is applied through the drag-cable. However, the only digging force that can be applied is the weight of the bucket and the pull of the drag-cable. Consequently, the dragline cannot dig as hard material as the shovel.

Where to Use It

In general, the dragline is ideally fitted for digging where:

1. Material to be dug is soft to medium hard.
2. Digging is at or below machine level.
3. Digging and dumping points are relatively far apart, both horizontally and vertically.
4. Material need not be dumped accurately within a small space.

FIGURE 4
BASIC MOTIONS
OF A CLAMSHELL

C L A M S H E L L

Using the same boom as the dragline, the clamshell is fitted with a bucket consisting of two half-scoops hinged together at the top so they can be closed to pick up material between the halves.

How it Works

The digging action of the clamshell is entirely vertical; it does not have either the "out" motion of the shovel or the "in" motion of the dragline. Three basic motions make up the clamshell operating-cycle:

1. Hoist -- two lines control the bucket. Closing-line closes and lifts the closed full bucket; holding-line handles the open, empty bucket.
2. Swing
3. Dump -- releasing closing-line dumps bucket, with holding-line keeping bucket over dumping point.

Since the only digging force available is the closing action and the weight of the bucket, the clamshell cannot dig as hard material as either dragline or shovel. A tagline operating a counterweight inside the boom is attached to the bucket to retard twisting.

Where to Use It

The clamshell can dig and dump below, at, or above the level on which the machine stands. This makes it ideal for such jobs as digging pits and shafts, transferring material from stockpiles to hoppers; unloading material from gondola cars or boats, and placing it in hoppers or stockpiles. In general, the clamshell should be used where:

1. Material is soft or loose.
2. Digging point is readily accessible only to a vertically operating bucket.
3. Dumping must be accurately controlled into a relatively small hopper or opening, especially where this dumping point is at considerable heigth above the machine.

FIGURE 5
A TYPICAL CRANE OPERATION

C R A N E

This front-end is used for lifting instead of digging. A simple hook-block replaces the clamshell bucket on the hoist line running over a sheave at the point of the same lattice-type boom used on dragline and clamshell.

How It Works

The three main motions in the crane operating cycle are:

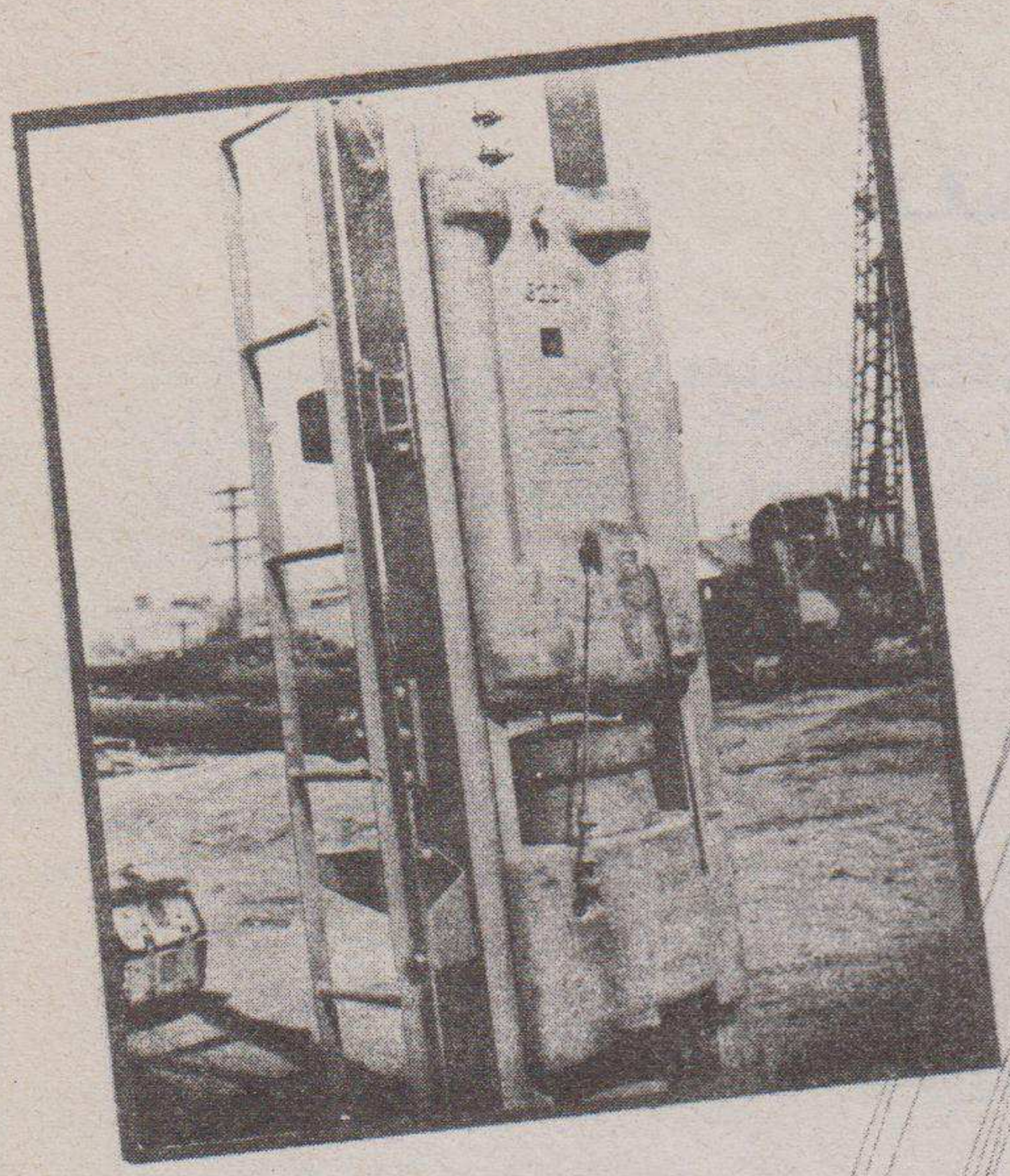
1. Hoist
2. Swing
3. Boom hoist

Accurate placing of the load is especially important in such crane work as steel setting. For this reason, the load control afforded by the regular hoist line is supplemented by an independent boom hoist. Full power control of both raising and lowering the boom permits accurate spotting of the load in the horizontal as well as the vertical plane. (Lowering boom will move the load out, raising boom will bring it in).

Where to Use It

In general, use the crane for lifting jobs where material can be attached to a hook.

FIGURE 6
PILEDRIVER
FRONT-END



P I L E D R I V E R

The piledriver uses the dragline-clamshell-crane boom. To the boom-point are attached hammer-leads which hold the pile in driving position and guide the hammer. The leads do not quite touch the ground and are held in place at their lower end by a strut attached to the boom-foot.

How It Works

The two principal parts of the piledriver cycle are:

1. Hoisting the pile into driving position--which may require use of swing and propel.
2. Handling the hammer.

One line hoists the hammer and the other hoists the piles into place. The repeated blows of the falling hammer on the pile-cap drive the pile.

Where to Use It

This is a one-purpose front-end and is used only for the driving of piles or sheeting.

15-B SPECIFICATIONS

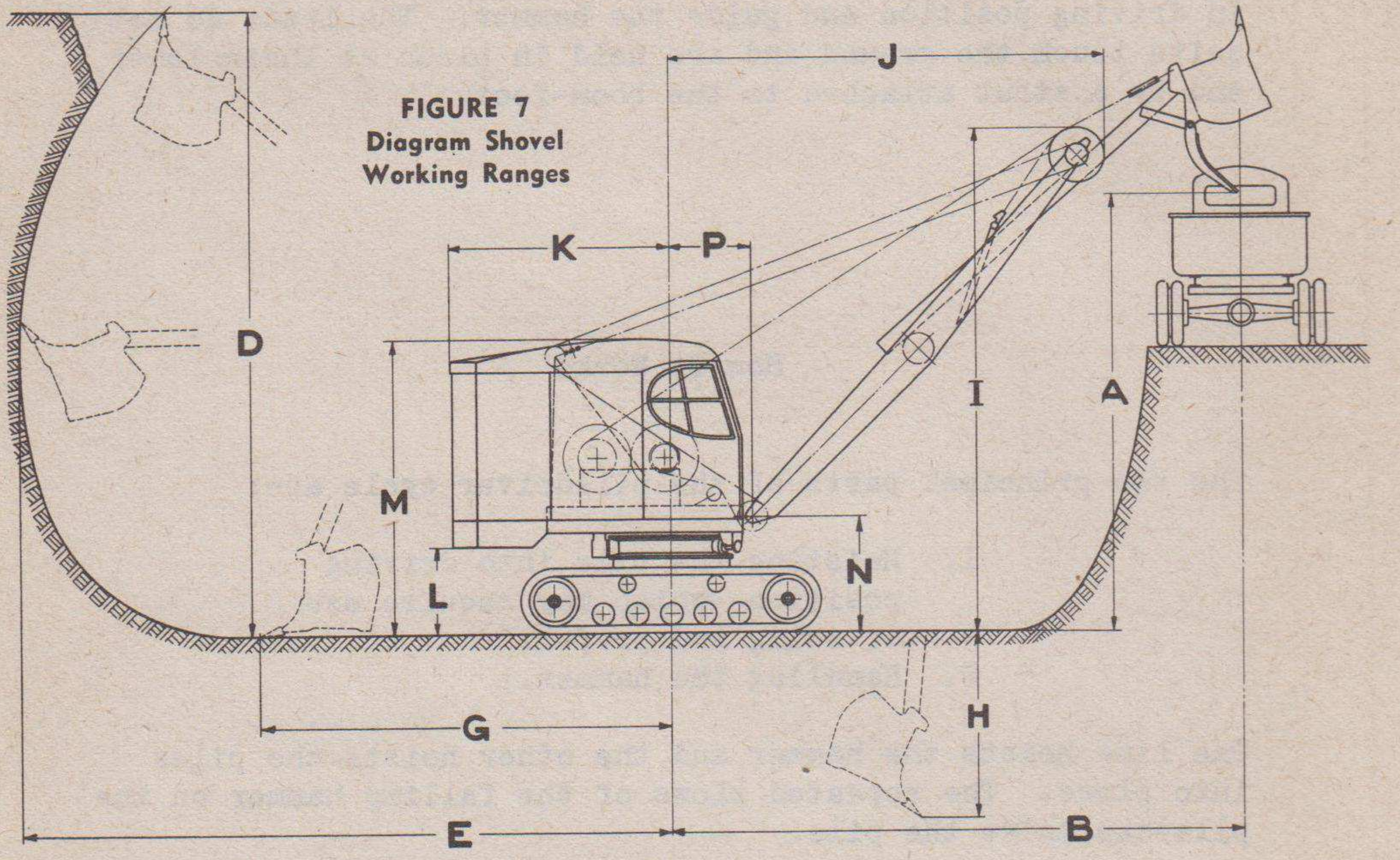
No. 15 - B — 541

These specifications are inserted here for ready reference. They show working ranges, clearances, capacities, and other information often convenient for operator use.

These specifications are complete and accurate to the best of our knowledge at the time of publication but they do not limit or extend the express warranty contained in the contract of sale.

SHOVEL—POSITIVE CROWD

FIGURE 7
Diagram Shovel Working Ranges



SHOVEL WORKING RANGE DIMENSIONS

Capacity of Dipper	½ cu. yd.				
Length of Boom	15′-6″				
Length of Handle	12′-6″				
Angle of Boom	40°	45°	50°	55°	60°
A —Dumping Height—Max.	12′-6″	13′-9″	15′-0″	16′-0″	17′-0″
B —Dumping Radius—at Max. dumping hght.	20′-0″	19′-0″	18′-0″	16′-9″	15′-6″
B_1—Dumping Radius—Max.	21′-0″	20′-6″	20′-0″	19′-6″	19′-0″
D —Cutting Height—Max.	18′-9″	20′-0″	21′-6″	22′-9″	24′-0″
E —Cutting Radius—Max.	24′-3″	23′-9″	23′-3″	22′-9″	22′-3″
G —Radius of Level Floor—Max.	16′-3″	16′-0″	15′-9″	15′-6″	14′-9″
H —Digging Depth below ground level—Max.	6′-3″	5′-9″	5′-3″	5′-0″	4′-6″
I —Clearance height of boom point	16′-0″	16′-9″	17′-9″	18′-6″	19′-3″
J —Clearance radius of boom point	16′-0″	15′-0″	14′-0″	13′-0″	11′-9″

K —Clearance Radius of Revolving Frame (Std. Cwt. "A")	7′-6″
L —Clearance under Frame to Ground Level	2′-7″
M —Clearance Height—Boom Lowered	10′-0″
N —Height of Boom Foot Pin Above Ground Level	4′-4″
P —Distance Boom Foot Pin to Center of Rotation	3′-1″

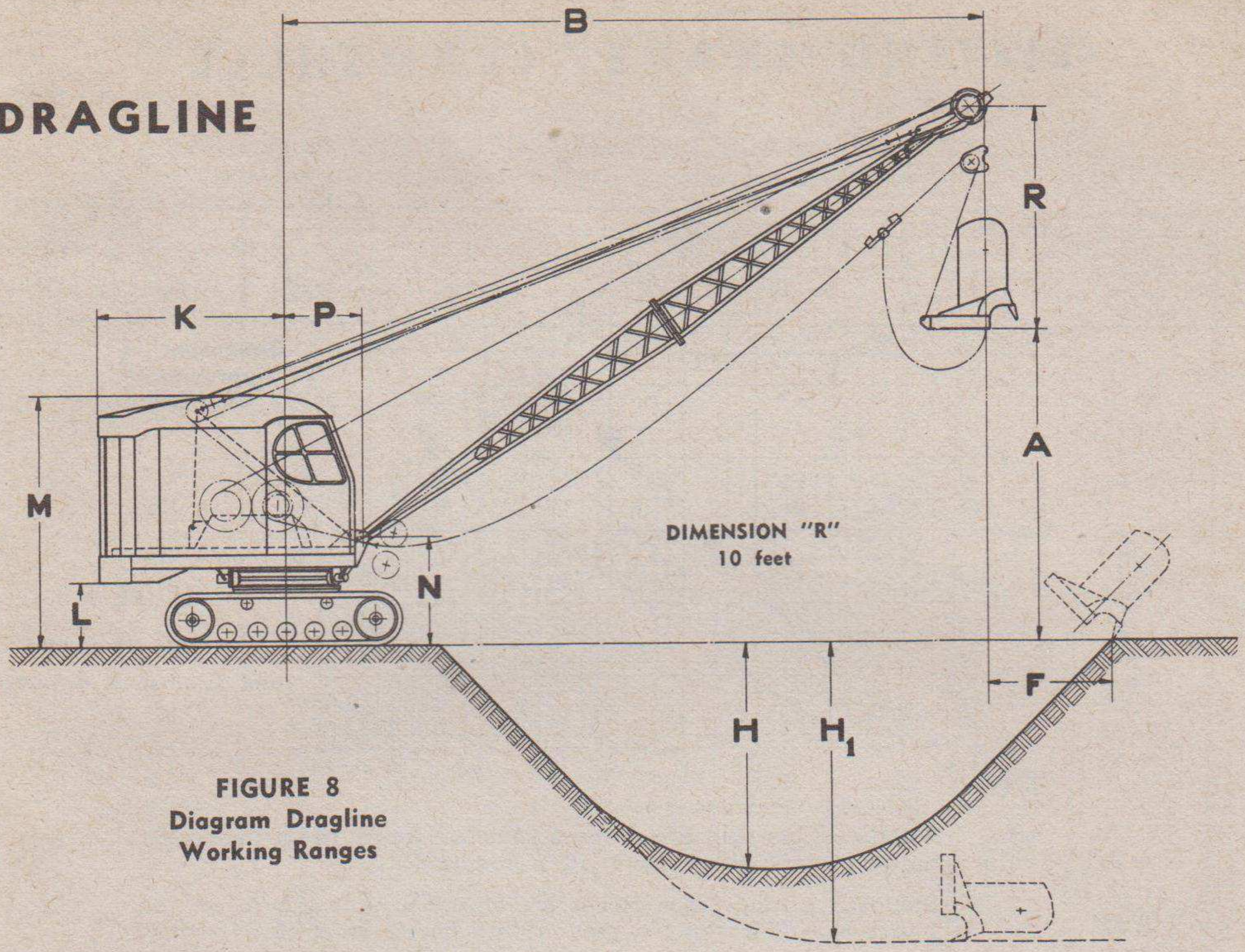


FIGURE 8
Diagram Dragline
Working Ranges

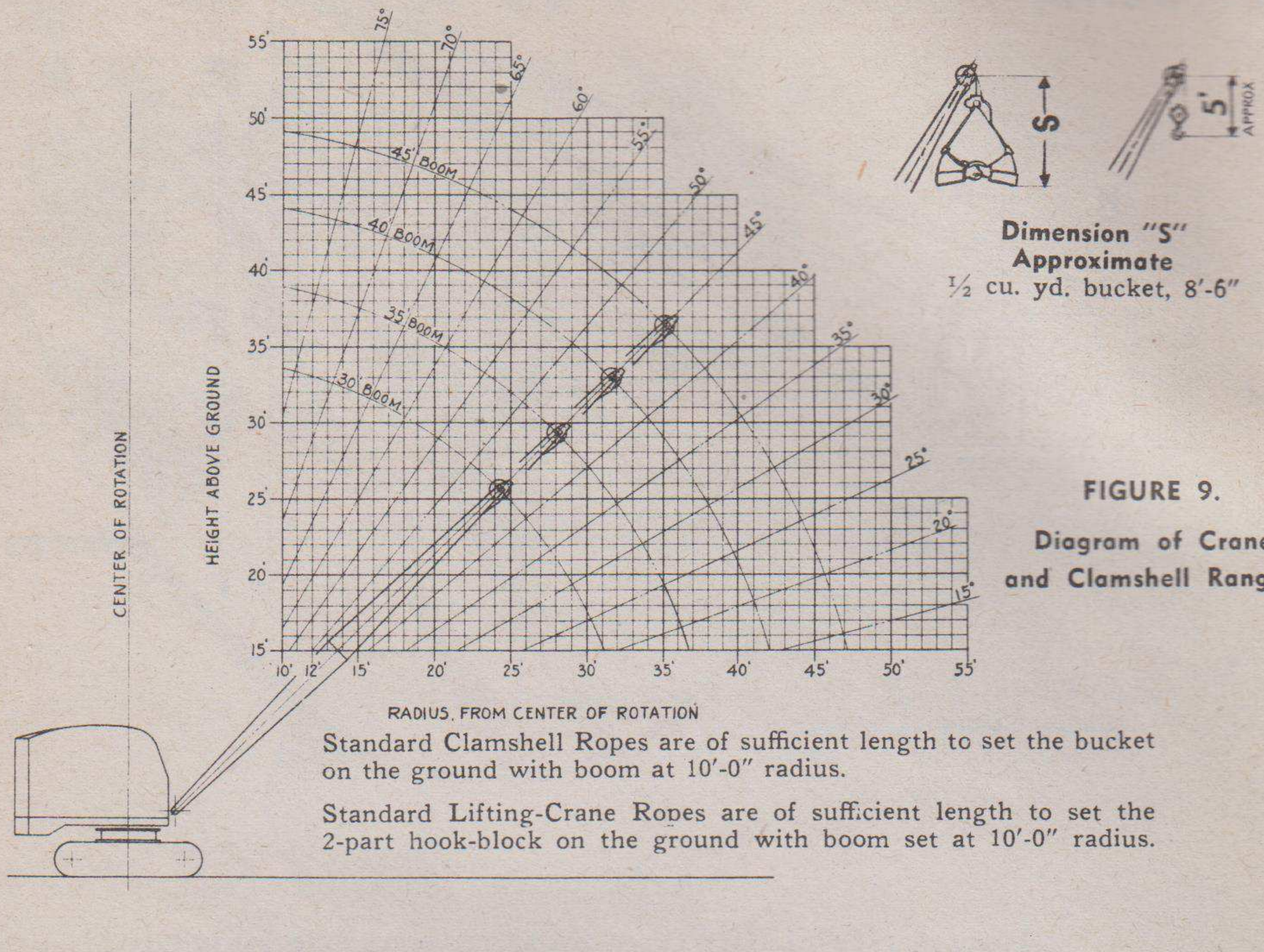
DRAGLINE WORKING RANGE DIMENSIONS

A	—Dumping height—(Height of boom point minus R)	See Page 17, Table 3
B	—Dumping reach—(Operating radius)	See Page 17, Table 3
F	—Throw of bucket ⅓ to ½ Dumping height (A) Depending on operator.	
H H1	—Digging Depth—The standard ropes furnished with a dragline are of sufficient length to allow an approximate digging depth equal to the difference between the length of boom and the height of the boom point sheave pin above ground as shown in Table 3.	
K	—Clearance radius of revolving frame—(Counterweight "A")	7′-6″
K1	—Clearance radius of revolving frame (Counterweight "B")	8′-0¾″
L	—Clearance under frame to ground level	2′-7″
M	—Clearance height—Boom lowered	10′-0″
N	—Height of boom foot pin above ground level	4′-4″
P	—Distance boom foot pin to center of rotation	3′-1″

TABLE 1 — WEIGHTS OF DRAGLINE BUCKET

	Type of Bucket	Bucyrus-Erie Red Arch Type AX
	Capacity of Bucket	½ cu. yd.
	Weight of Empty Bucket	1,300 lbs.
Weight of Bucket Loaded With	Earth, moist (1 cu. yd. weighs approx. 2,500#)	2,550 lbs.
	Sand, dry " " " 2,700#)	2,650 lbs.
	Sand, wet " " " 3,300#)	2,950 lbs.
	Gravel " " " 2,900#)	2,750 lbs.
	Loose stone " " " 2,700#)	2,650 lbs.
	Clay, wet " " " 3,000#)	2,800 lbs.

LIFTING CRANE, CLAMSHELL



Dimension "S"
Approximate
½ cu. yd. bucket, 8'-6"

FIGURE 9.

Diagram of Crane and Clamshell Ranges

Standard Clamshell Ropes are of sufficient length to set the bucket on the ground with boom at 10'-0" radius.

Standard Lifting-Crane Ropes are of sufficient length to set the 2-part hook-block on the ground with boom set at 10'-0" radius.

TABLE 2 — WEIGHTS OF CLAMSHELL BUCKETS

	Type of Bucket	Kiesler Excavating Bucket
	Capacity of Bucket	½ cu. yd.
	Weight of Empty Bucket, Lbs. (approximate)	2,350 lbs.
Weight of Bucket and Load With Material Shown	Earth, moist (1 cu. yd. weighs approx. 2,500#)	3,600 lbs.
	Sand, dry " " " 2,700#)	3,700 lbs.
	Sand, wet " " " 3,300#)	4,000 lbs.
	Gravel " " " 2,900#)	3,800 lbs.
	Loose stone " " " 2,700#)	3,700 lbs.
	Clay, wet " " " 3,000#)	3,850 lbs.
	Coal " " " 1,350#)	3,025 lbs.
	Cinders " " " 1,100#)	2,900 lbs.
	Ashes " " " 900#)	2,800 lbs.

The weights given above are approximate only, and should be checked with actual weights.

Allowance should be made for possible overloading. Weights as above include bucket counterweights and teeth.

Kiesler Type 38-N Digging Bucket

Weights: Bucket only 1800 lbs., teeth 185 lbs., counterweights 356 lbs.

Rated capacity: Plate line 13½ cu. ft.; heaped 15½ cu. ft.; water level 9 cu. ft.

Width: 2'-4".

Length: Open 5'-6"; closed 5'-3".

Height: Open 7'-1"; closed 5'-6".

Sheave diameter: 10".

Cable: 9 16" diameter. Length reeved, open 27'-7"; Length reeved, closed 19'-9".

Teeth: Nickel-chrome alloy steel. Teeth bolts, alloy steel. Counterweights used to help teeth penetrate hard and compact material. Remove for steady operating in light material where extra weight not needed.