DEALERS' CATALOG

80M

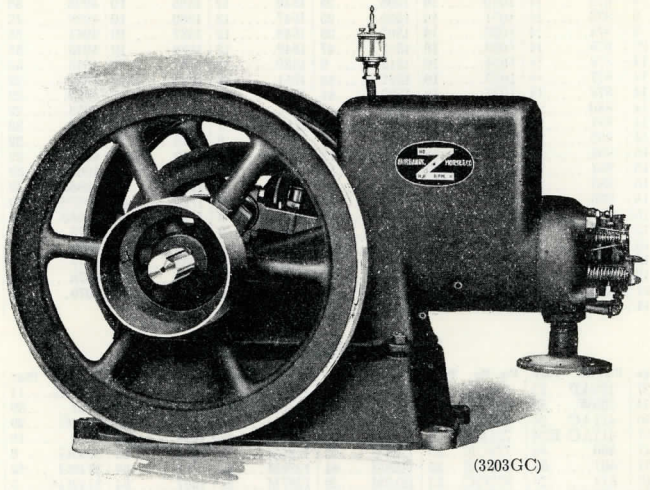
FAIRBANKS, MORSE & CO.

(INCORPORATED)

DEALERS' CATALOG

Air Compressors
Corn Shellers
Electric Light Plants
Farm Engines
Feed Grinders
Fodder Cutters
Power Heads
Pumps and Pump Jacks
Washing Machines
Water Systems
Windmills
Wood Saws

Special bulletins on these lines are available for use of the consumer. Reference to these is made at the bottom of each page



(3203GC)

80 M

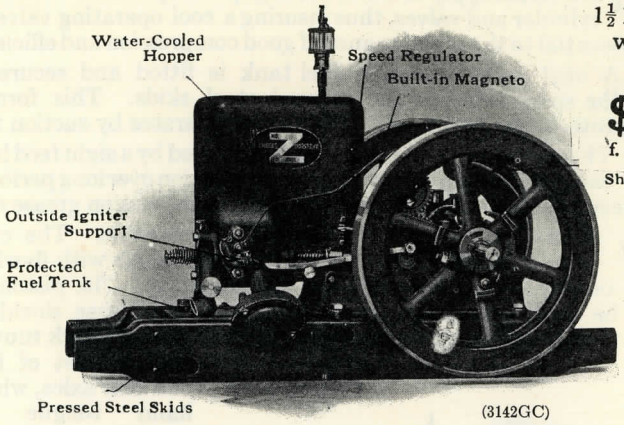
Classified Index

Code Word Index

Outfit Number Index

Figure Number Index

"More than Rated Power and a Wonder at the Price"



1½ H. P. on Skids with built-in Magneto

$58.50

f. o. b. Factory

Shield

The 1½ H. P. Engine

Distinctive Features of Construction

1. **Built-in Magneto**
2. **Speed Regulator**
3. **Removable Bushings in Bearings**
4. **Close Speed Regulation**
5. **Pressed Steel Skids**
6. **Protected Fuel Tank**

This is a high-grade, precisely built engine in every detail, made of finest materials throughout, by the use of modern tools, efficient methods and expert workmanship. All parts are perfectly standardized and made interchangeable, and the quality that is built into this engine cannot be excelled at any price.

One-Piece Casting Following the lines laid down in modern automobile construction, the cylinder and crank case are cast together. This construction results in an effective distribution of metal, giving strength where needed with lightest weight. It also gives positive assurance of maintaining alignment between the cylinder and the shaft.

Crank Shaft and Details By the use of drop-forged crank shaft and connecting rod, properly designed, long life and rigidity of construction are assured. All bearings are fitted with removable and interchangeable bushings, including a bronze bushing on the piston pin. Every bearing is ground accurately to dimensions.

Compression By the grinding of the piston and piston rings to exceedingly close limits, exceptionally good compression is secured and maintained over long periods of use.

Speed Control The governor is mounted in the flywheel, effectively controlling the speed of the engine on the hit-and-miss principle. The engine is further arranged with a speed regulator which permits of varying the speed while the engine is in operation. The governor actively maintains any speed for which the regulator may be set.

1½ H. P. Type "Z" Gasoline Engine

Distinctive Features of Construction

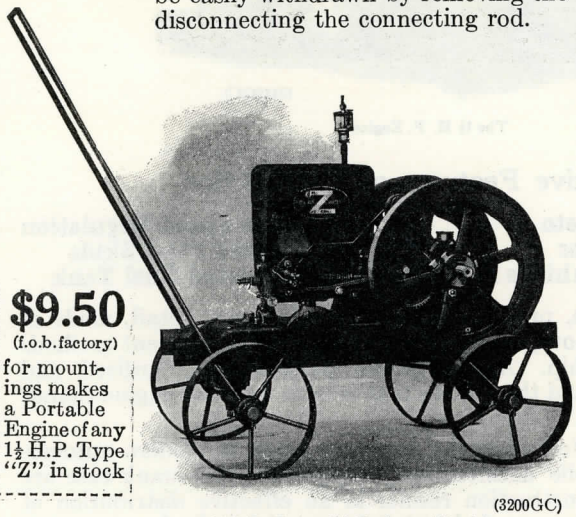
Water Cooled A liberal supply of water cooling space is provided around the cylinder and valves, thus insuring a cool operating valve and seat which is essential to the maintenance of good compression and efficiency.

Fuel Tank A neat galvanized iron fuel tank is fitted and secured in the space between the pressed steel skids. This form of construction protects the fuel tank. The engine operates by suction feed.

Lubrication The piston and piston rings are lubricated by a sight feed lubricator, while ample provision for lubrication over long periods of operation is secured on all other working parts by compression grease cups.

Accessibility Every part is built to be readily accessible. The crank case is made open so that the entire shaft with flywheels can be taken out by simply removing the bearing caps. The piston can be easily withdrawn by removing the crank case shield and disconnecting the connecting rod.

$9.50
(f.o.b. factory)
for mountings makes a Portable Engine of any 1½ H.P. Type "Z" in stock



(3200GC)

1½ H. P. Type "Z" Engine on Hand Truck

Handtruck mountings consist of front and rear axles, wheels, hand tongue and brackets for supporting the engine on the axles. These brackets are bolted directly to the skid through bolt holes regularly provided in all engines. Thus, as any stock engine can be made portable, **it is only necessary for the dealer to carry the mountings** in addition to his regular stock of engines in order to make up portables as needed.

Specifications of 1½ H. P. Type "Z" Gasoline Engines

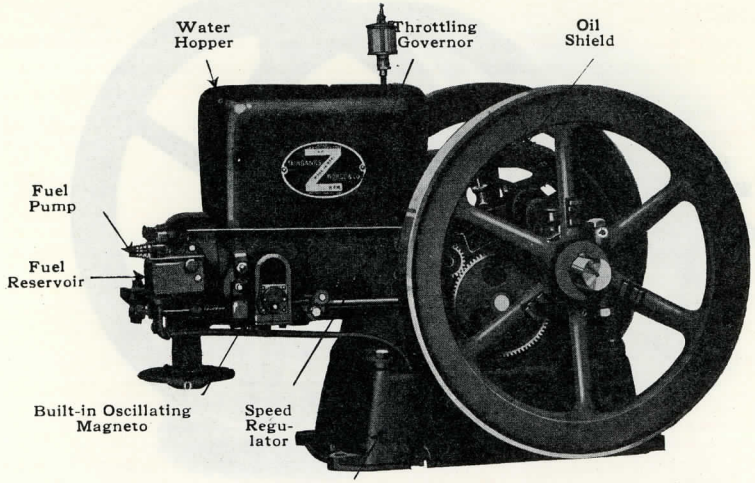
Outfit No.	Horse Power.	Speed, R. P. M.	Size Belt Pulley in inches.		Diam. Flywheel in inches.	Floor Space in inches with Starter Crank Allowance.	Extreme Height in inches.	Fuel Tank Capacity in gallons.	Water Hopper Capacity in gallons.	Approx. Ship. Wt., pounds.	Code Word	Price F. O. B. Factory
			Diam.	Face.								
157o	1½	500	6	4	17	30 x 38	25	1½	3	300	Shiny	$58.50

Hand Truck Mountings for 1½ H. P. Type "Z" Gasoline Engines

Truck No.	*See Note Below			Wheels (Inches)	Tread (Inches)	Approx. Ship. Weight (Pounds)	Code Word	Price F. O. B. Factory
	Width (Inches)	Length, with Handle up (Inches)	Height (Inches)					
1½	23½	38	34	12x2	21½	63 Bundled	Smite	$9.50

*These are the dimensions after the engine has been mounted.

3 H. P. and 6 H. P. Type "Z" Oil Engines



(3371G)

No effort is spared in making these Type "Z" Engines of the very highest quality in every detail. All parts are precisely made and fitted and standardized for interchangeability. The cylinder and crank case being cast together distributes the weight where needed for strength, giving lightness as well. The finely ground piston and piston rings give exceptional compression. The water cooled cylinder and valves eliminate heat strains and keep the valves tight. The effective lubrication—accessibility—reliability—are found in every one of these engines.

In addition to all this—the Type "Z" Oil Engines have special distinctive features that single them out from all others—that make them far superior in point of service rendered.

1. **Throttling Governor**
2. **Built-in Oscillating Magneto**
3. **Pump Fuel Feed**
4. **Speed Regulator**
5. **Removable Bushings in Bearings**
6. **Close Speed Regulation**
7. **Igniter fitted by ground and tapered joint**

Use Cheapest Fuel They are designed to run on kerosene, distillate, coal oil, tops, and other cheaper fuels as well as gasoline. They deliver the same power on a gallon of kerosene as on a gallon of gasoline.

Construction details are given in dealers' Bulletin No. H201.

Specifications of 3 H. P. and 6 H. P. Type "Z" Oil Engines

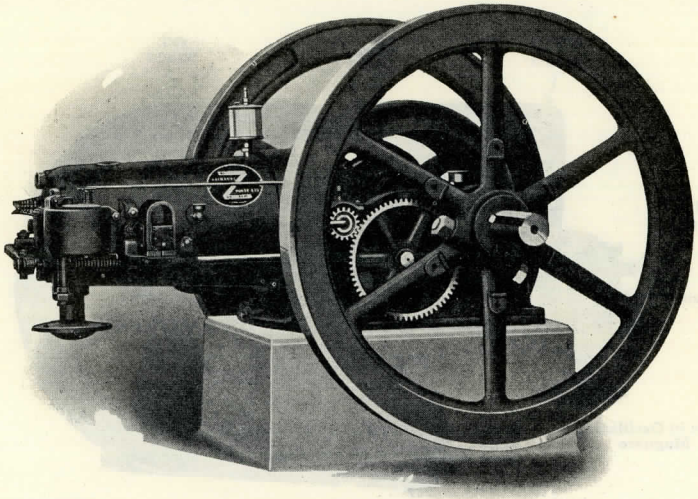
Outfit No.	Horse Power.	Speed R. P. M.	Floor Space in inches with Crank Starter Allowance.	Extreme Height in inches.	Size Belt Pulley in inches. Diam.	Face.	Diameter Flywheel in inches.	Fuel Tank Capacity in gallons.	Water Hopper Capacity in gallons.	Approx. Ship. Wt., pounds.	Code Words.	Price F. O. B. Factory
1577	3	450	34x39	28	10	6	22	2.8	3.75	500	Shock	$108.00
1578	6	400	40x48	32	12	6	28	5.5	9	900	Shode	$189.00

Hand Trucks for 3 H. P. and 6 H. P. Type "Z" Engines

Truck No.	For	*See Note Below Width (Inches)	Length, with Handle up (Inches)	Height (Inches)	Diameter Wheels (Inches)	Tread (Inches)	Approx. Ship. Weight (Pounds)	Code Words for Hand Truck only	Price F. O. B. Factory
3	3 H.P. Engine	26¾	40¾	38	12x2	23	75 Bundled	Smile	$11.75
6	6 H.P. Engine	32⅛	51½	46¼	14x3	28	150 Bundled	Smirk	19.00

*These are the dimensions after the engine has been mounted.

10 H. P. and 15 H. P. Type "Z" Oil Engines
With Throttling Governor



(3396G)

10 H. P. Type "Z" Oil Engine showing Built-in Oscillating Magneto and Throttling Governor

These Type "Z" Oil Engines have several modifications in design, fitting them to meet conditions where more power is required.

1. After once properly adjusting, **varying loads** will be handled by the engine **without readjustment.**
2. Will handle successfully, **kerosene, low grade distillates and coal oil tops** as well as gasoline, under light or full loads or varying loads in cold weather; and will deliver the **same power** on a gallon of kerosene as on a gallon of gasoline.
3. **Speed-changing device** permits changing of speed while engine is running.
4. Has **built-in oscillating magneto,** consequently no batteries are required.
5. The metal is correctly distributed, with all lines of stress and strain properly reinforced to get **maximum strength and durability** with minimum weight. There is practically no inactive material in this engine.
6. This engine being equipped with **fuel pump,** can be installed with the fuel supply tank located outside the building and at a lower level, if desired.
7. **Crank shaft is forged steel** with extra wide bearing surfaces.
8. Has **interchangeable die-cast liners** in main and crank bearings.
9. The **Throttling Governor** causes it to run much smoother and with less vibration than any engine with the Hit-and-Miss control.

Specifications of 10 H. P. and 15 H. P. Type "Z" Oil Engines

Outfit Numbers	Horse Power	Speed, R. P. M.	Floor Space, Inches	Extreme Height, Inches	Size Belt Pulley, Inches		Size Fly-wheels, Inches		Fuel Tank			Circulating Water Pipe Opening Inches	Approx. Shipping Weight, Lbs.	Code Words
					Diam.	Face	Diam.	Face	Diam., Inches	Length, Inches	Capacity, Gallons			
1564	10	350	63 x 42	44	16	10	41	2½	18	52	53	1	1950	Rebus
1571	15	350	69 x 54	47	18	12	44	3	18	52	53	1¼	2350	Serve

The pulley furnished with each engine is regularly attached to the flywheel opposite the governor side, but bosses are provided so it can be placed on the governor side of the engine if desired.

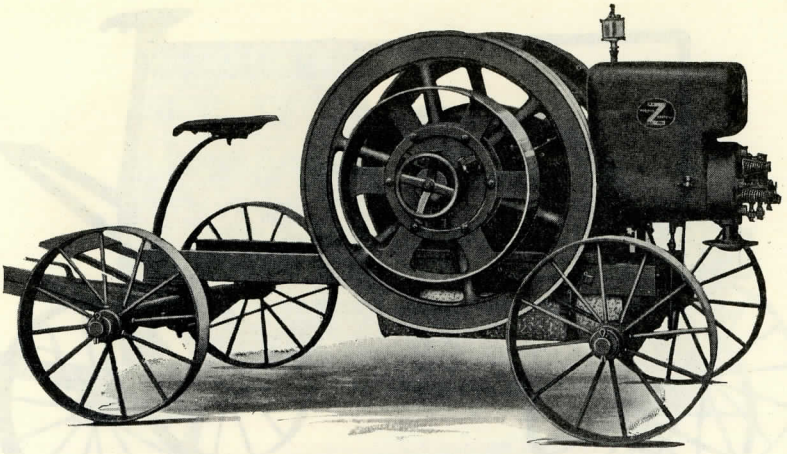
Accessories furnished with these engines include: Two lengths of ¼-inch pipe and two lengths of ⅜-inch pipe, with fittings to connect the fuel tank with the engine.

An exhaust silencer, with one short nipple, to connect to the engine.

One adjustable wrench, one cylinder oil can, one hand oil can, one quart measure, duplicate springs, asbestos packing, funnel, and book of instructions.

Extras which can be furnished at an additional cost: Cooling tank, circulating pump, exhaust pot, friction clutch pulley, foundation bolts.

10 H. P. Type "Z" Portable Oil Engine
With Throttling Governor



(3262G)

10 H. P. Type "Z" Portable Oil Engine, showing the Hopper Cooler and Friction Clutch Pulley

The 10 H. P. Type "Z" Portable Oil Engine is made to work under the most exacting conditions on the farm or for the contractor. It is exceedingly well adapted for portable work because of its light weight and excellent balance.

A cooling hopper cast with the cylinder jacket holds enough water to maintain the proper working temperature.

The truck is made entirely of steel and properly designed to stand the wear and tear of rough roads. The seat, double tree, bolt and neck yoke are included with each portable engine.

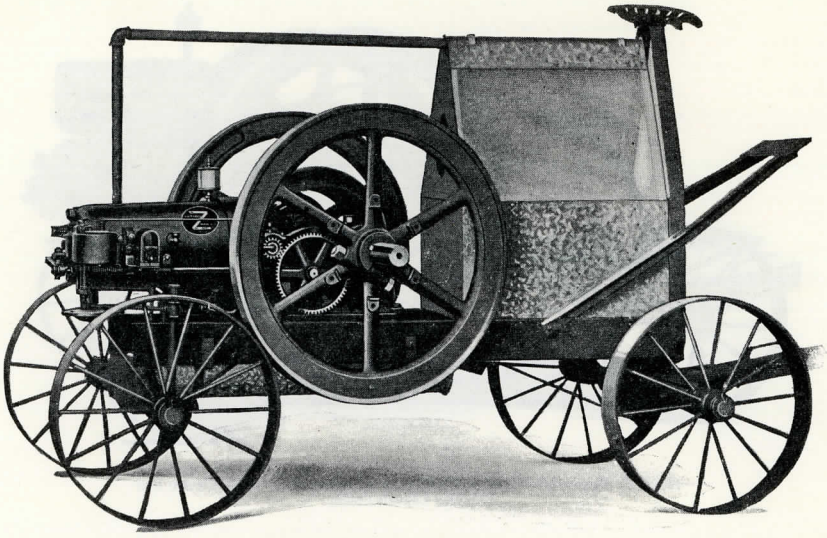
The fuel supply tank is of ample size and is suspended from the channel irons under the engine, well out of the way and protected from injury.

A friction clutch pulley attached to the flywheel on the side opposite to the governor side of the engine is a part of the regular equipment. A brake can be supplied on the truck at extra cost, when so ordered.

Specifications of 10 H. P. Type "Z" Portable Oil Engine

Outfit No.	Horse Power	Speed R. P. M.	Floor space without pole and cross tree	Extreme Height Inches	Size of Flywheel Inches		Size of Belt Pulley Inches		Size of Truck Wheel Inches		Tread—Inches	Size of Axles Inches		Cap. Fuel Tank Gallons	Cooling Water Capacity Gallons	Approximate Shipping Weight	Code Word
					Diam.	Face	Diam.	Face	Diam.	Face		Front	Rear				
1569	10	350	8′6½″x5′8″	52	41	2½	26	6½	26	4	56	2	2	14	20	2550	Scrim

15 H. P. Type "Z" Portable Oil Engine
With Throttling Governor



(3156G)

15 H. P. Type "Z" Portable Oil Engine, showing the Screen Cooler and Oscillating Magneto

The 15 H. P. Type "Z" Portable Oil Engine, like the 10 H. P., is exceptionally efficient under the exacting conditions of the farm or the contractor. The light weight and excellent balance make it especially practical for portable use.

It is equipped with a screen cooler which maintains the proper working temperature with a minimum quantity of water.

The truck is made entirely of steel and properly designed to stand the wear and tear of rough roads. The seat, double tree, bolt and neck yoke are included with each portable engine.

The large fuel supply tank is suspended from the channel irons under the engine, well out of the way and protected from injury.

A friction clutch pulley attached to the flywheel on the side opposite to the governor side of the engine, is a part of the regular equipment. A brake can be supplied on the truck at extra cost, when so ordered.

Specifications of 15 H. P. Type "Z" Portable Oil Engine

Outfit No.	Horse Power	Speed R. P. M.	Floor space without pole and cross trees	Extreme Height Inches	Size of Flywheel Inches		Size of Belt Pulley Inches		Size of Truck Wheel Inches		Tread—Inches	Size of Axles Inches		Cap. Fuel Tank Gallons	Cooling Water Capacity, Gallons	Approximate Shipping Weight	Code Word
					Diam.	Face	Diam.	Face	Diam.	Face		Front	Rear				
1575	15	350	10′-0″x5′-9″	75	44	3	26	8½	32	6	56	3	2½	19	23	3450	Shine

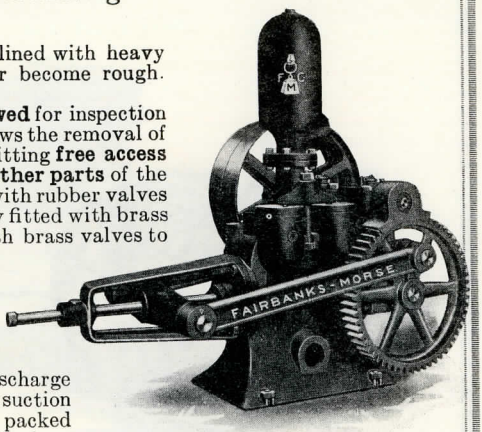
"Typhoon" Power Pumps

Double Acting

These pumps have a single cylinder lined with heavy brass tubing so it will not corrode or become rough. Steel piston rod covered with brass.

Any or all of the **valves can be removed** for inspection by simply loosening two nuts which allows the removal of two yokes and four valve covers, permitting **free access to all valves without disturbing any other parts** of the pump. All pumps are regularly fitted with rubber valves except 2x3 and 2½x5, which are regularly fitted with brass wing valves; others can be fitted with brass valves to order. Valve seats are brass and screwed into the valve decks except 2x3 and 2½x5, which are fitted with a driven seat. All bearings are babbitt lined and gears are machine cut.

Each pump has an air chamber of sufficient size to insure uniform flow. Discharge can be turned to any quarter. Vertical suction lift not over 20 feet. The pistons are packed with cup leathers except sizes 2x3 and 2½x5, these have pistons packed with square flax packing.



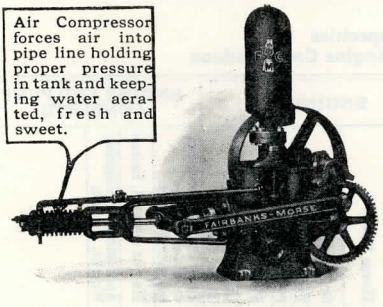
6 x 10 "Typhoon" Pump (1039M)

Sizes and Capacities—"Typhoon" Double-Acting Power Pumps—Belt Driven

Outfit Numbers	Cylinder, Inches	Stroke, Inches	Speed, R. P. M.	Capacity			Pipe Sizes, Short Length		Tight and Loose Pulleys, Inches	Ratio of Gearing	Floor Space, Inches	Height Over All, Inches	Approx. Shipping Weight, Pounds	Code Words
				Gals. per Revolution	Gals. per Minute	Maximum Pressure, Pounds	Suction Inches	Discharge, Inches						
508	2	3	60	.077	4.67	200	1	¾	10x2½	3–1	27x16	26½	120	Nacre
1484	3	3	60	.179	10.78	80	1¼	1	10x2½	3–1	28x17¼	23	125	Nacker
1515	2½	5	40	.199	7.98	200	1¼	1	16x4	5–1	40x30½	35½	400	Nibbed
509	3	5	40	.292	11.70	80	1¼	1½	16x2½	5–1	39x22	33¾	280	Naid
468	5	5	40	.825	33.01	80	2	2	16x4	5–1	43x30½	35½	450	Naive
1391	6	10	40	2.383	95.32	80	3	3	24x4	5–1	56x37½	49	1200	Nadder

For larger pumps, send for special bulletins.

Air Compressor forces air into pipe line holding proper pressure in tank and keeping water aerated, fresh and sweet.



(1285M)
3 x 5 "Typhoon" Pump

"Typhoon" Power Pumps with Air Compressors

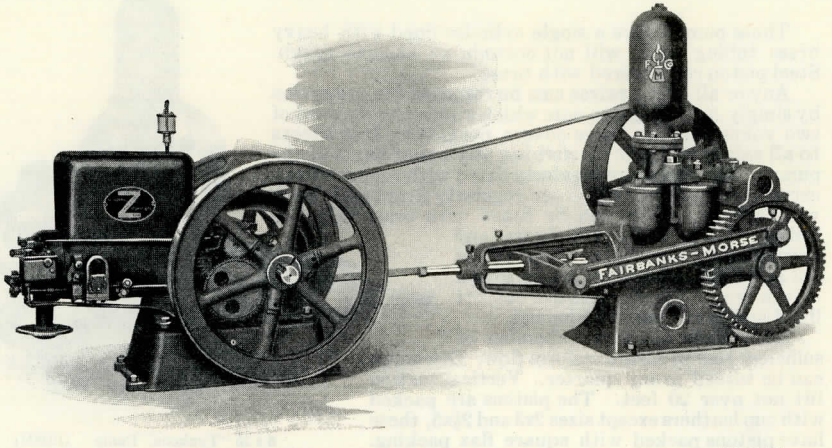
The "Typhoon" pump and air compressor unit illustrated is designed for use with farm or suburban home pneumatic water systems. It has the double advantage of **greater compactness** and a more **moderate price** than a separate pump and compressor. As air is pumped into the pipe line by the compressor end of the set, the tank pressure is maintained and the water kept fresh and palatable. The highest standards of construction—ample cooling fins, steel piston and standard compressor valves—insure unfailing operation and long life.

Sizes and Capacities—"Typhoon" Pumps with Air Compressor Attachment—Belt Driven

Outfit Numbers	Cylinder, Inches	Stroke, Inches	Speed, R. P. M.	Capacity			Pipe Sizes, Short Length		Tight and Loose Pulleys, Inches	Ratio of Gearing	Floor Space, Inches	Height Over All, Inches	Approx. Shipping Weight, Pounds	Code Words
				Gals. per Revolution	Gals. per Minute	Maximum Pressure, Pounds	Suction, Inches	Discharge, Inches						
1579	3	3	60	.179	10.78	80	1¼	1	10x2½	3–1	28x17¼	23	150	Showy
1580	3	5	40	.292	11.70	80	1¼	1¼	16x2½	5–1	39x22	33¾	310	Shred
1581	5	5	40	.825	33.01	80	2	2	16x4	5–1	43x30½	35½	490	Shrew
1582	6	10	40	2.383	95.32	80	3	3	24x4	5–1	56x37½	49	1250	Shrub

"Typhoon" Power Pumps and Engines

Belt-Driven Combinations



6 x 10 "Typhoon" Pump and 6 H. P. Type "Z" Oil Engine (3242GC)

These pumping outfits are well adapted for tank pumping, watering stock, irrigation, for factory or suburban water systems, and are often used for pumping into storage tanks in city buildings.

The following combinations of engines and pumps have been made up for convenience in ordering, the capacity and pressure being shown for each. A special straight face pulley is furnished on the engine for belting to tight and loose pulleys on the pump. The regular accessories are furnished with the engine. The belt is not included, as this should be ordered to suit local conditions.

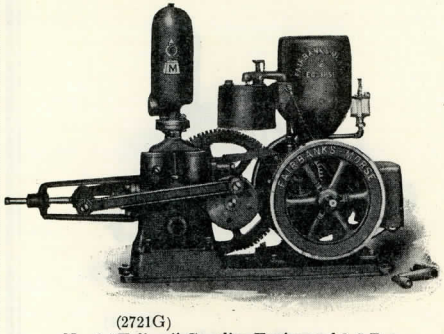
Sizes and Capacities
"Typhoon" Pumps and Engine Combinations

Outfit Nos.	TYPHOON PUMP, BELT DRIVE									ENGINE						ENGINE AND PUMP COMPLETE			
Engine and Pump	Cylinder, Inches	Stroke, Inches	Approximate Pump Speed, R. P. M.	Capacity Gallons per Minute	Capacity Maximum Pressure, Pounds	Pipe Sizes Suction, Inches	Pipe Sizes Discharge, Inches	Ratio of Gearing	Tight and Loose Pulleys, Inches	Type of Engine	Horse Power	Speed, R. P. M.	Pulley Inches to drive pumps at listed speeds	Fuel Tank, Gallons	Water Evaporator Tank, Gallons	Floor Space Computed in allowing 8 feet between pulleys	Height over all, Inches	Approximate Shipping Weight, Pounds	Code Words
1477	2	3	70	5.4	200	1	$\frac{3}{4}$	3–1	10x2$\frac{1}{4}$	*ECL	No. 1	700	3x4	1	2	23x114	27	380	Nailer
1583	2	3	66	5.1	200	1	$\frac{3}{4}$	3–1	10x2$\frac{1}{4}$	Z	1$\frac{1}{2}$	500	4x4	1$\frac{3}{4}$	3	30x133	27	430	Shrug
1479	3	3	58	10.3	80	1$\frac{1}{4}$	1	3–1	10x2$\frac{1}{4}$	*ECL	No. 1	700	2$\frac{1}{2}$x4	1	2	23x127	25	385	Naked
1584	3	3	66	11.8	80	1$\frac{1}{4}$	1	3–1	10x2$\frac{1}{4}$	Z	1$\frac{1}{2}$	500	4x4	1$\frac{3}{4}$	3	30x133	25	435	Shuck
1585	2$\frac{1}{2}$	5	43	8.5	200	1$\frac{1}{2}$	1	5–1	16x4	*ECL	No. 2	700	5x8	1$\frac{1}{4}$	3$\frac{3}{4}$	31x118	36	770	Shunt
1586	2$\frac{1}{2}$	5	43	8.5	200	1$\frac{1}{2}$	1	5–1	16x4	Z	1$\frac{1}{2}$	500	7x8	1$\frac{3}{4}$	3	34x122	36	710	Sibyl
1587	2$\frac{1}{2}$	5	45	8.9	200	1$\frac{1}{2}$	1	5–1	16x4	Z	3	450	8x8	2.8	3$\frac{3}{4}$	38x131	36	920	Sicca
1483	3	5	43	12.5	80	1$\frac{1}{2}$	1$\frac{1}{2}$	5–1	16x2$\frac{1}{2}$	*ECL	No. 2	700	5x4	1$\frac{1}{4}$	3$\frac{3}{4}$	31x118	34	650	Nakedly
1588	3	5	38	11.0	80	1$\frac{1}{2}$	1$\frac{1}{2}$	5–1	16x2$\frac{1}{2}$	Z	1$\frac{1}{2}$	500	6x4	1$\frac{3}{4}$	3	30x122	34	590	Sidle
1589	3	5	45	13.1	80	1$\frac{1}{2}$	1$\frac{1}{2}$	5–1	16x2$\frac{1}{2}$	Z	3	450	8x4	2.8	3$\frac{3}{4}$	34x131	34	800	Sieve
1590	5	5	38	31.3	55	2	2	5–1	16x4	Z	1$\frac{1}{2}$	500	6x8	1$\frac{3}{4}$	3	34x122	36	760	Sight
1591	5	5	45	37.1	80	2	2	5–1	16x4	Z	3	450	8x8	2.8	3$\frac{3}{4}$	38x131	36	970	Silky
1724	6	10	38	90.	79	3	3	5–1	24x4	Z	3	450	10x8	2.8	3$\frac{3}{4}$	38x135	49	1750	Silly
1725	6	10	40	95.	80	3	3	5–1	24x4	Z	6	400	12x8	5$\frac{1}{2}$	9	42x143	49	2100	Since

*Eclipse.

"Typhoon" Power Pumps and "Eclipse" Engines

Gear-Driven Combinations



(2721G)
No. 2 "Eclipse" Gasoline Engine and 3x5 Pump

The geared pumping combinations are specially adapted for use in connection with water systems and tank pumping, because they occupy little space, and, being mounted on a cast-iron sub-base in tandem arrangement, have the gearing rigidly and permanently aligned. No special foundation is required.

Gasoline tank and battery are attached to each engine, so that the outfits are entirely self-contained. A standard pulley is regularly furnished.

Sizes and Capacities—"Typhoon" Pumps and "Eclipse" Engines—Gear Driven

Outfit Nos. for Engine and Pump	"Typhoon" Pump—Gear Drive							"Eclipse" Engine					Engine and Pump Complete			
	Cylinder, Inches	Stroke, Inches	Approx. Speed, R. P. M.	Capacity: Gallons per Minute	Capacity: Max. Pressure, Pounds	Suction Pipe Size, Inches	Discharge Pipe Size, Inches	Size of Engine	Speed, R. P. M.	Pulley, Inches	Fuel Tank, Gallons	Water Evaporator Tank, Gallons	Floor Space, Complete Outfit, Inches	Height over all, Inches	Approx. Shipping Weight, Pounds	Code Words For Engine and Pump
1180	2	3	60	4.67	200	1	¾	No. 1	700	4x2½	¾	1	15x44	28½	310	Tymud
1316	3	5	44	12.8	80	1½	1½	No. 2	700	5x4	1¼	3¾	30x58	38	630	Dedolent

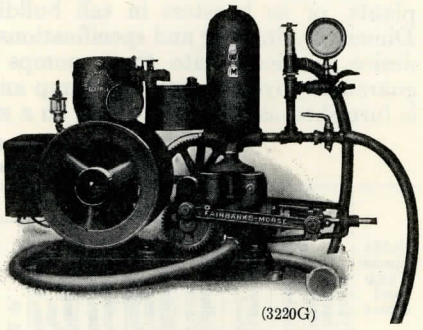
Use Bulletin 179 for consumers.

"Eclipse" Spraying Outfit

The No. 1 "Eclipse" Gasoline Engine and 2x3 "Typhoon" Pump makes a compact practical spraying outfit, light enough to be readily handled, yet complete in all details. It will maintain a working pressure of 200 pounds, necessary for effective spraying.

The following accessories are furnished with Outfit 1154, ready for attaching two lines of hose:

1 1x¾" bushing.
1 Length 1" smooth bore hard rubber suction hose, 8' 0" long.
1 Fig. No. 1087, Hose screen strainer, for 1" hose.
3 Fig. No. 686, Hose clamps for 1" hose.
2 ¼" short nipples.
2 ¾x4" nipples.
1 Fig. No. 2754 brass pressure relief valve for ¾" pipe set at 200 lbs.
1 ¾" lever handle stop cock.
1 ¾" close nipple.
1 1" to ¾" reducer.
1 ¾x4" nipple.
1 ¾x2½" nipple.
2 ¾" tees.



(3220G)
"Eclipse" Spraying Outfit No. 1154

1 Fig. 2755 brass "Y" connection with shut off valves.
1 ¼" short nipple.
1 Fig. 342 300-lb. 3½" dial single spring brass ring pressure gauge with stop cock.
2 Fig. 2759 brass hose coupling for ½" hose.
2 Lengths of 1" garden hose 4' 6" long.
1 Illustration showing engine and pump fittings.

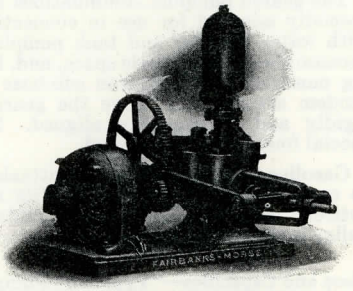
The suction hose and relief valve discharge hose, with connections, are regularly included with all outfits but the discharge hose, extension pipe or nozzles are not regularly included, these can be supplied and will be found listed in Catalog 75.

Specifications of "Eclipse" Spraying Outfit

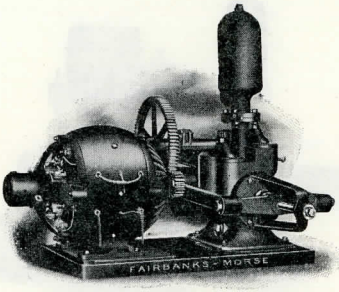
Outfit Number	No. Lines of Hose Fitted to Take	"Typhoon" Double-Acting Pump								No. 1 "Eclipse" Gasoline Engine						Floor Space Complete, Inches	Height Over all, Inches	Shipping Weight Complete Outfit, Lbs.	Code Word for Complete Outfit
		Cylinder, Inches	Stroke, Inches	Speed, R.P.M.	Capacity Gals. per Min.	Working Pressure, Lbs.	Number of ¼" Power Spray Nozzles can be maintained at Stated Pressure	Suction, Inches	Discharge, Inches	Speed, R. P. M.	Pulley, Inches	Flywheels, Inches	Gasoline Tank, Gallons	Water Evap. Tank Capacity, Gallons					
1154	1 or 2	2	3	60	4.7	200	2	1	¾	700	4x2½	14x1¾	¾	1		15x44	24½	310	Charpoy

Use Bulletin H171 for consumers.

Motor Driven "Typhoon" Power Pumps



(1241M)
5x5 "Typhoon" Pump
Direct Connected to 3 H. P. Induction Motor



(1242M)
5x5 "Typhoon" Pump
Direct Connected to 2½ H. P. Direct Current Motor

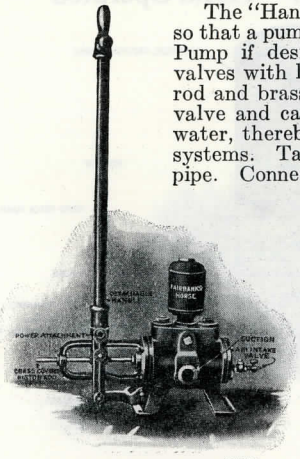
Motor driven "Typhoon" pumps are especially useful for first class pneumatic or gravity water supply systems for farms, suburban homes, summer resorts, clubs, and villages where water is to be pumped from lake, spring, shallow well or cistern where electric current is available. A compressor attachment shown on page 9 can be supplied at additional cost.

The smooth running qualities and compact, self-contained construction appeal to architects and practical engineers for use in the basements of buildings, in connection with water systems, heating plants, refrigerating plants, or as boosters in tall buildings where storage tanks are used. Dimension drawing and specifications furnished to responsible parties who desire to incorporate these pumps in their building plans. A single guarantee covers motor and pump and protects the user of this set which is furnished as a complete unit on a single base.

Sizes and Capacities
"Typhoon" Pumps Direct Connected to Motors

Outfit Number Pump and Motor	Double-Acting Pump—Gear Drive							Motor				Pump and Motor Complete			
	Cylinder Diameter, Inches	Stroke, Inches	Approximate Speed, R.P.M.	Gallons per Minute	Maximum Pressure, Pounds	Suction Pipe, Size, Inches	Discharge Pipe, Size, Inches	H. P.	Speed, R.P.M.	Type	Frame	Floor Space, Inches	Height Over All, Inches	Approximate Shipping Weight, Pounds	Code Word
Direct Current—115 or 230 Volts															
1534	2	3	60	4.67	200	1	¾	1	1150	RM	133	28x30	24	435	Odmyl
1535	3	3	60	10.78	80	1½	1	1	1150	RM	133	28x30	26	440	Offal
1536	2½	5	40	7.98	200	1½	1	1½	1150	RM	134	46x42	36	985	Opium
1537	3	5	40	11.70	80	1½	1½	1	1150	RM	133	40x36	36	700	Optic
1538	5	5	40	33.01	80	2	2	2½	1350	CP	5	46x42	38	870	Ogham
1539	6	10	40	95.32	80	3	3	7½	1050	CP	8	66x62	53	1775	Ogive
Alternating Current—2 or 3 Phase—110, 220, 440, 550 Volts—60 Cycles															
1540	2	3	60	4.67	200	1	¾	1	1200	B	H6A	28x30	24	315	Ogler
1541	3	3	60	10.78	80	1½	1	1	1200	B	H6A	28x30	26	320	Ohmic
1542	2½	5	40	7.98	200	1½	1	2	1200	B	H6B	46x42	36	765	Orage
1543	3	5	40	11.70	80	1½	1½	1	1200	B	H6A	40x36	36	580	Oilet
1544	5	5	40	33.01	80	2	2	3	1200	B	H8A	46x42	38	860	Olden
1545	6	10	40	95.32	80	3	3	7½	1200	B	H10B	66x62	53	1705	Olive
Alternating Current—Single Phase—110 or 220 Volts—60 Cycles															
1546	2	3	60	4.67	200	1	¾	1	1200	Cent.	P6	28x30	24	370	Olney
1547	3	3	60	10.78	80	1½	1	1	1200	Cent.	P6	28x30	26	375	Ombre
1548	2½	5	40	7.98	200	1½	1	2	1200	Cent.	P10B	46x42	36	915	Omega
1549	3	5	40	11.70	80	1½	1½	1	1200	Cent.	P6	40x36	36	635	Onset
1550	5	5	40	33.01	80	2	2	3	1200	Cent.	P15B	46x42	38	1020	Opera
1551	6	10	40	95.32	80	3	3	7½	1200	Cent.	P25	66x62	53	1820	Opine

"Handy" Force Pumps

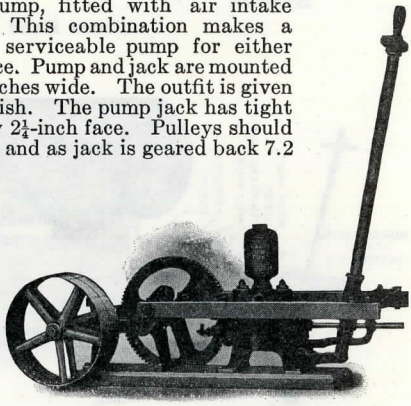


(2135)

The "Handy" Force Pump is made sufficiently heavy and strong so that a pump jack can be attached, turning it into a Power Force Pump if desired. It has a 3-inch brass lined cylinder, metal valves with leather face, brass valve seats, brass covered piston rod and brass stuffing box. It is fitted with a special air intake valve and can be used for pumping small quantities of air with water, thereby making it especially adapted for pneumatic water systems. Tapped for 1¼-inch suction pipe and 1-inch discharge pipe. Connections can be made on either side of pump. The pump is double acting and gives about ⅕-gallon of water with each double stroke or about 7 gallons per minute when operated by hand. Must set within 18 or 20 feet of low water level. Approximate shipping weight 65 pounds. Code word, Skeel.

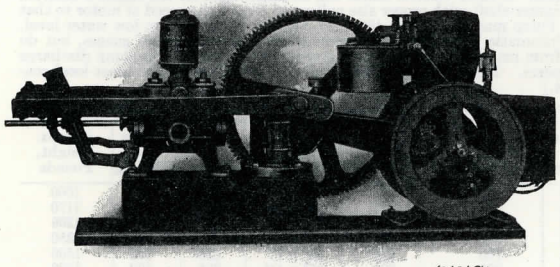
"Handy" Power Force Pump

The "Handy" Power Pump is a combination of our No. 4-C "Handy" pump jack and "Handy" force pump, fitted with air intake valve. This combination makes a strong, serviceable pump for either hand or light power at a very moderate price. Pump and jack are mounted on a hard wood base 34 inches long, 7½ inches wide. The outfit is given two coats of paint, giving it an artistic finish. The pump jack has tight and loose pulleys 13 inches in diameter by 2¼-inch face. Pulleys should have a speed of about 215 to 250 R. P. M., and as jack is geared back 7.2 to 1, the pump is operated at about 30 to 35 strokes per minute. Capacity about 400 gallons per hour. Can be safely operated against 60 to 70 pounds pressure. Air and water or water alone can be pumped as desired. When operated by power the handle can be detached by unscrewing from socket. When operated by hand the pump jack should be detached by drawing out a single pin. Floor space 21″x44″, height to top of air chamber 19″, length of maple pitmans 30″. Approximate weight 150 lbs. Code word, Skein.



"Handy" Force Pump and No. 4-C Jack (1255M)

"Eclipse" Engine and "Handy" Power Force Pump



(3184G)

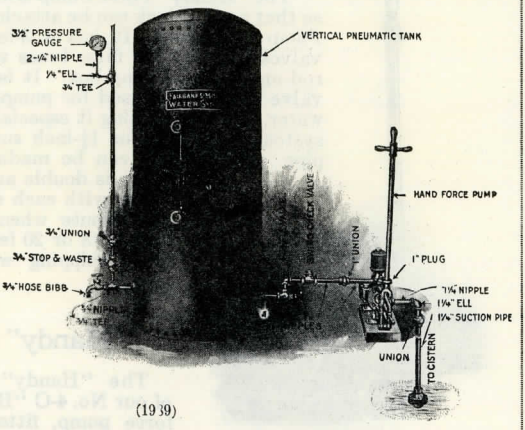
Outfit No. 1153

An ideal outfit for use in connection with small Pneumatic Water Systems. Consists of No. 1 "Eclipse" Engine direct connected to a "Handy" Force Pump, with air intake, mounted on hard wood base. Has a capacity of about 400 gallons per hour. Engine is complete within itself and can be easily removed for use in connection with other equipment. Floor space 18″ x 53″, height 24″, approximate shipping weight 360 pounds. Code word, Skelp.

Residence Pneumatic Water System—Hand Operated

Simple pneumatic water system, for supplying a moderate quantity of water for bathroom and kitchen use, is shown in Fig. 1989. The tank generally used (Outfit 853), has a total capacity of 220 gallons, which, allowing one-third space for air, will deliver about 150 gallons of water. Other sizes of tanks can be used. The "Handy" Force Pump (Fig. 2135), shown on page 13, is fitted with a 3-inch brass-lined cylinder and air intake attachment. The outfit can be set up very nicely in the basement, and the suction pipe connected to the cistern or well. The pump must set within 18 to 20 feet of low water level.

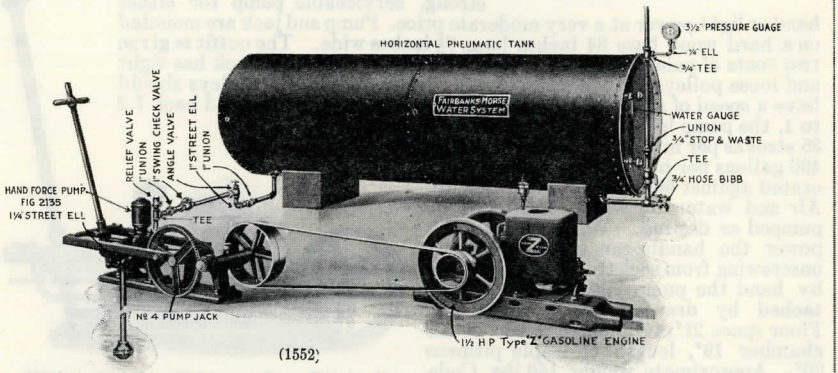
The outfits listed below include the Vertical Pneumatic Tank and Pump with all fittings, valves and gauges, but do not include suction pipe (from pump to the well), nor discharge or service pipe (from pump discharge to tank and from tank outlet to the house). These will have to be ordered specially to meet the local conditions in each case (see Bulletin 184).



(1939)

Suburban Pneumatic Water System

Combined Hand and Power



(1552)

A combined hand and power pneumatic water system, which can be set up in the basement and used for supplying water for kitchen, bathroom, laundry, etc., is shown in Fig. 1552. Lawn sprinkling could be done while the engine is running. The tank generally used has a capacity of 420 gallons (Outfit 872), which, allowing one-third for air space, will deliver about 280 gallons of water at one pumping. Other sizes of tanks can be used. A brass lined "Handy" force pump (Fig. 1255M), as shown on page 13, is used, having an air intake attachment. The pump jack can easily be detached when it is desired to pump by hand. A 1½ H. P. Type "Z" gasoline engine will operate the pump jack by belt. A small electric motor can be substituted for the engine if desired, in which case it is necessary to use a counter-shaft with proper size pulleys to reduce the speed of motor to that required to operate the pump jack. Pump must set within 18′ or 20′ vertical distance from low water level.

The outfits include Horizontal Pneumatic Tank and Pump with all fittings, valves and gauges, but do not include engine, belt, suction pipe (from pump to well), nor discharge or service pipe (from pump discharge to tank and from tank outlet to the house). These items will have to be ordered specially to meet local conditions in each case. (See Bulletin 184.)

Residence Pneumatic Water System Fig. 1989

Outfit Number	Size Tank Diam. x Length	Capacity, Gals. Total	Capacity, Gals. Working	Approx. Weight, Pounds
850	24″ x 5′	120	80	550
851	24″ x 6′	145	95	575
852	30″ x 5′	180	120	600
853	**30″ x 6′**	**220**	**145**	**645**
854	36″ x 5′	265	175	700
855	36″ x 6′	315	210	825

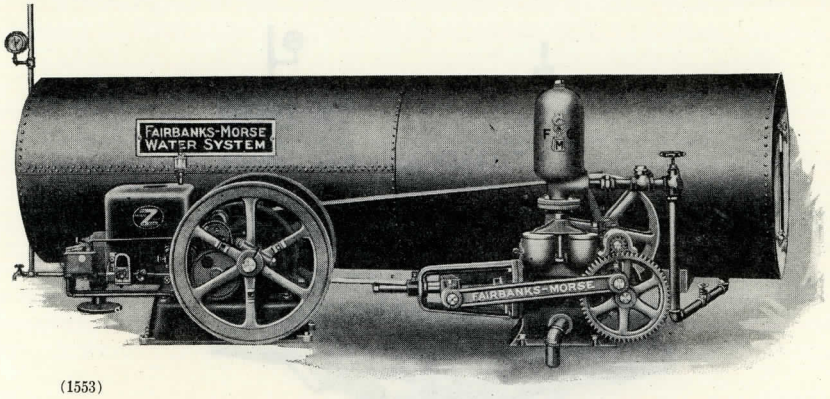
Use 1¼″ Galv. Pipe from well to pump. Use 1″ Galv. Pipe from pump to tank. Use ¾″ Galv. Pipe discharge from tank.

For other tanks, belting and accessories, see Bulletin 184.

Suburban Pneumatic Water System Fig. 1552

Outfit Number	Size Tank Diam. x Length	Capacity, Gals. Total	Capacity, Gals. Working	Approx. Weight, Pounds
870	30″ x 8′	295	195	1000
871	30″ x 10′	365	240	1170
872	**36″ x 8′**	**420**	**280**	**1200**
873	36″ x 10′	525	350	1350
874	36″ x 12′	630	420	1500
875	36″ x 14′	735	490	1700
876	42″ x 10′	720	480	1950
877	42″ x 12′	865	575	2200
878	42″ x 14′	1000	665	2500

"Typhoon" Pneumatic Water Systems
For Engine Drive



(1553)

The "Typhoon" Pneumatic Water Systems are made up to meet the requirements of farms, country clubs, hotels, hospitals, public schools and factories, and can be furnished with any desired size of pneumatic tanks to suit conditions. It is advisable to use a tank sufficiently large to store two or three days' supply. Always install an outfit large enough to easily take care of the maximum amount of water that will be required. The "working capacity" of pneumatic tanks is about two-thirds their total capacity.

The outfits consist of combinations of "Typhoon" Pumps and Horizontal Pneumatic Pressure Tanks, with all fittings, valves and gauges, but do not include engine, belt, suction pipe (from pump to well), or discharge or service pipe (from pump discharge to tank or from tank to the house). These items will have to be ordered specially to meet local conditions in each case. (See Bulletin 184.)

The pumps are supplied with an air intake valve, but, if so ordered, a separate air compressor can be used, or the "Typhoon" pumps can be supplied with air compressor attachment (see page 9) at an extra charge. The capacities, working pressures, etc., of the "Typhoon" pumps are given on page 9.

The engine can be stopped at a suitable maximum pressure by an automatic "Battery Circuit Breaker," as shown on page 58, which can be connected to the pressure tank by means of $\frac{1}{4}$-inch pipe. This accessory is only furnished on special order. The engine is started by hand. A water relief valve is placed in the pipe, between the pump and the tank, and set at 75 pounds pressure to prevent damage to pump, engine or tank.

3″ x 5″ "Typhoon" Pneumatic Pressure Water System—For 1½ H. P. "Z" Engine Drive

Outfit Number	Size Tank Diam. x Length	Capacity		Approximate Weight, Pounds
		Total Gallons	Working Gallons	
860-A	30″ x 8′	295	195	675
861-A	30″ x 10′	365	240	750
862-A	36″ x 8′	420	280	875
863-A	**36″ x 10′**	**525**	**350**	**950**
864-A	36″ x 12′	630	420	1100
865-A	36″ x 14′	735	490	1250
866-A	42″ x 10′	720	480	1500
867-A	42″ x 12′	865	575	1700
868-A	42″ x 14′	1000	665	1950

The 3″ x 5″ "Typhoon" Pump can also be furnished on one base with No. 2 Eclipse Pumper (Outfit No. 1316, see page 11).

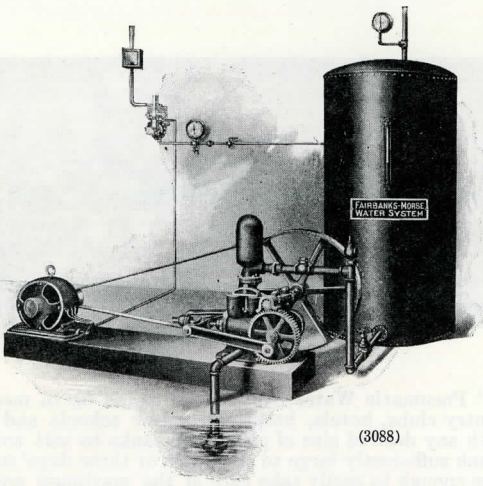
Use 1¼″ Galv. Suction Pipe; 1¼″ Galv. Pipe from pump to tank and 1″ Galv. Pipe for discharge from tank. Always order the tank "Tapped for 1¼″ Pipe."

5″ x 5″ "Typhoon" Pneumatic Pressure Water System—For 3 H. P. "Z" Engine Drive

Outfit Number	Size Tank Diam. x Length	Capacity		Approximate Weight, Pounds
		Total Gallons	Working Gallons	
892-A	36″ x 14′	735	490	1270
894-A	**42″ x 14′**	**1000**	**665**	**1970**
896-A	48″ x 16′	1500	1000	2680
899-A	48″ x 24′	2260	1500	4020

Use 2″ Galv. Suction Pipe; 2″ Galv. Pipe from pump to tank, and 1″ Galv. Pipe for discharge from tank. Always order the tank "Tapped for 2″ Pipe. For other tanks, belting or accessories, see Bulletin 184.

"Typhoon" Pneumatic Water System
For Electric Drive



(3088)

These Electrically Driven "Typhoon" Pneumatic Water Systems are ideal for residence use, because they operate automatically, insuring a constant supply of water under pressure.

An Electro-Pneumatic Controller (Fig. 1566, page 58) is used for starting and stopping the motor at predetermined minimum and maximum pressure—generally within a variation of about 21 to 25 pounds.

A tank 36″ x 6′, with working capacity of 210 gallons, is recommended for ordinary household service.

The outfits consist of combinations of a 3″ x 5″ "Typhoon" pump, equipped with a special 30″ pulley, horizontal pneumatic pressure tank, electro-pneumatic controller, leather belt, with all fittings, valves and gauges, but do not include the electric motor, with special pulley, wire, suction pipe (from pump to well), or discharge or service pipe (from pump discharge to tank, or from tank to the house). These items will have to be ordered specially to meet local conditions in each case. (See Bulletin 184.)

The pumps are supplied with an air intake valve, but, if so ordered, a separate air compressor can be used, or a "Typhoon" pump can be supplied, with air compressor attachment (see page 9), at an extra charge.

Either direct or alternating current motors, 110 or 220 volts, can be supplied for use with these outfits. A 1 H. P. motor will operate the 3″ x 5″ pump, giving about 700 gallons per hour against a pressure of about 80 pounds or its equivalent head. The motor, however, should be of slow speed and equipped with a special pulley to drive the pump pulley at about 200 revolutions per minute. The pump should set between 15 to 20 vertical feet of low water level.

When specially ordered, motor and sub-base can be supplied, as listed on page 17.

For other tanks, belting or accessories, see Bulletin 184.

3″ x 5″ "Typhoon" Pneumatic Pressure Water System—For Engine Drive

Outfit Number	Size Tank Diam. x Length	Capacity		Approximate Weight, Pounds
		Total Gallons	Working Gallons	
1030	30″ x 6′	220	145	850
1031	30″ x 8′	295	195	975
1032	**36″ x 6′**	**315**	**210**	**1025**
1033	36″ x 8′	420	280	1175
1034	36″ x 10′	525	350	1250
1035	36″ x 12′	630	420	1400
1036	36″ x 14′	735	490	1550
1037	42″ x 12′	865	575	2000
1038	42″ x 14′	1000	665	2250

Use 1½″ Galv. Suction Pipe; 1½″ Galv. Pipe from pump to tank, and 1″ Galv. Pipe for discharge from tank. Always order the tank "Tapped for 1½″ Pipe." For other tanks, belting or accessories, see Bulletin 184.

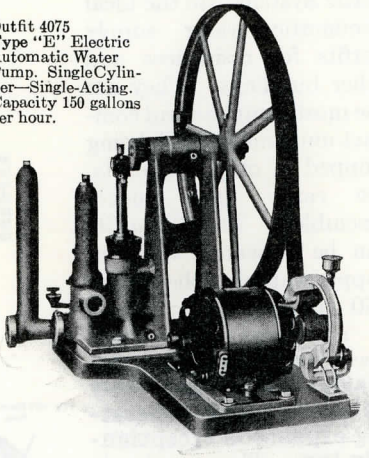
Type "E" Electric Automatic Water Pump

The Type "E" Electric Water Pumps illustrated here are automatic, perfect and noiseless in operation, remarkably simple in construction and will give many years of satisfactory service.

These pumps can be used with any type of water system, being especially adapted for pneumatic pressure systems. They may also be used for increasing city water pressure.

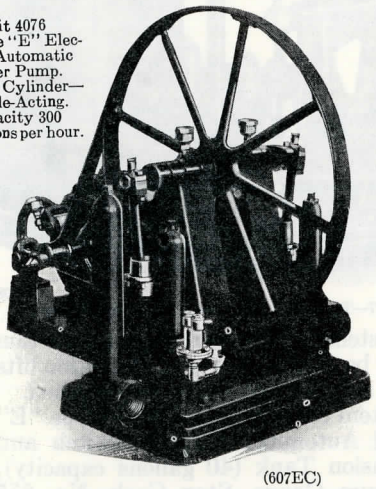
The **pumping capacity** is large and the motors regularly furnished provide pressures up to 35 pounds. If higher pressure is required, the pump should be ordered with a larger motor.

The **electric motor** used with Outfit 4075 is 1-6 horse power; with Outfit 4076, 1-3 horse power, either alternating or direct current. The single phase alternating current motors are a new repulsion-induction type, which start easily under full load, being arranged to handle overloads up to 100 per cent for some time without danger of burning out. These motors do the same work as split phase motors two and three times greater in horse power, and **use much less current when starting and when running.** Being single phase motors, they can be used on 1, 2 or 3-phase alternating current circuits. The direct current motors like the A. C. motors, start easily, are economical in the use of current, run quietly, require very little attention and are durably constructed.



Outfit 4075 Type "E" Electric Automatic Water Pump. Single Cylinder—Single-Acting. Capacity 150 gallons per hour.

(606EC)



Outfit 4076 Type "E" Electric Automatic Water Pump. Two Cylinder—Single-Acting. Capacity 300 gallons per hour.

(607EC)

The vertical **air chambers** absolutely prevent water hammer in the piping.

Automatic Belt Tightener always keeps belt tight and prevents it slipping, so there is no lost motion. Friction and wear are reduced to the minimum.

Cylinders are solid bronze, with a single stuffing box, easily accessible. The cylinder jacket is iron, cast in one piece with stand.

The heavy **bronze pistons** are of the simple plunger type. The connecting rods are iron, with bronze bushings. The main shaft bearings are phosphor bronze.

The **valves** operate and seat perfectly, are noiseless, easily accessible and can be removed quickly. They are a durable composition and either side may be used. The valve seats are also removable and are solid bronze.

Base is heavy iron, cast in one piece. It has a gutter around the edge to catch any drip.

Specifications of Type "E" Electric Automatic Water Pumps (no tank)

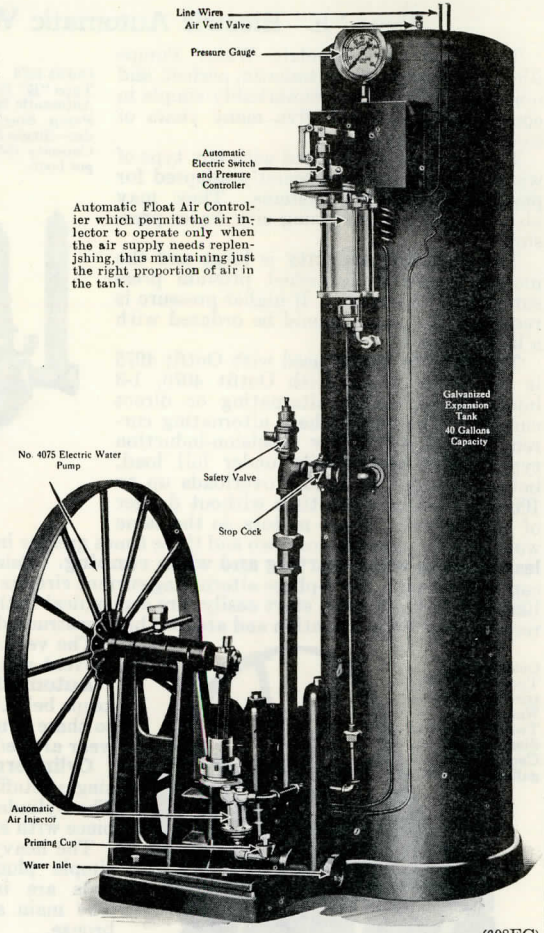
Outfit Number	Cylinders	Capacity, Gallons per hour	Maximum Vertical Height Water can be pumped at 35 lbs. pressure, Feet	*Maximum Vertical Suction Lift	Suction Pipe Size, Inches	Discharge Pipe Size, Inches	‡Motor H. P.	Belt Wheel, Inches	Floor Space, Inches	Height, Inches	Approx. Shipping Weight, Pounds	Code Words
4075	1	150	80	15	1¼	1	⅙	24x2	21 x32	28¾	265	Usher
4076	2	300	80	15	1½	1¼	⅓	24x2	25½x32	30½	480	Usual

*The suction lift can be increased up to 25 feet if a good foot valve and strainer is used.

‡Specify whether direct or alternating current motor is wanted; state voltage if direct current and voltage and cycles if alternating.

Type "E" Electric Automatic Water Systems

Type "E" Electric Automatic Systems are the ideal pneumatic water supply outfits for residences and other buildings. They are the most complete and compact units made, and, being shipped in only two parts, are easily and quickly assembled. These outfits can be depended upon to supply water (at the rate of 150 gallons per hour), year in and year out. Their operation is **entirely automatic** and **absolutely noiseless. The operating expense is exceptionally low.** They are simply and durably constructed, and will last indefinitely. The two systems are identical, except that the 4077 System has an Automatic Float Air Controller, which, by controlling the action of our air injector, keeps the proper proportion of air in the tank at all times, **without attention.** With the 4078 System, which has an ordinary water gauge, instead of the automatic air controller, it is necessary to vent the surplus air occasionally.



(608EC)

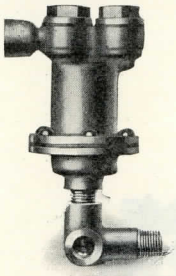
Outfit 4077—Type "E" Electric Automatic Water System

Adaptability. These water supply systems can be used where the suction lift does not exceed 15 feet. They may be used, however, with suction lifts up to 25 feet, if properly primed, as a good foot valve is furnished.

Equipment. The 4077 Water System consists of the 4075 Type "E" Electric Pump, with Air Injector and Automatic Electric Switch and Pressure Controller, Galvanized Expansion Tank (40 gallons capacity), Automatic Float Air Controller, Pressure Gauge, Stop Cock, No. 655 Foot Valve, with Strainer, No. 255 Safety Valve, Drain Cock, No. 345 Air Vent Valve, Iron Base and piping connections. The same equipment is furnished with the 4078 System, except that a water gauge is used in place of the Automatic Float Air Controller.

The pumping capacity is 150 gallons per hour. The motor regularly furnished will provide pressures up to 35 pounds. If a greater pressure is required, the pump must be ordered with a larger motor.

Type "E" Electric Automatic Water Systems



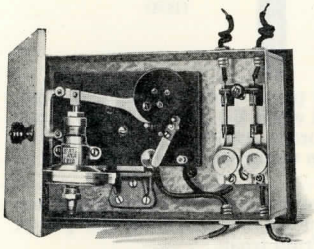
(604EC)

Type "E" Automatic Air Injector
Pat. Applied For

The **air injector** included with each pump, keeps a pressure tank well supplied with air, thus preventing it from becoming waterlogged.

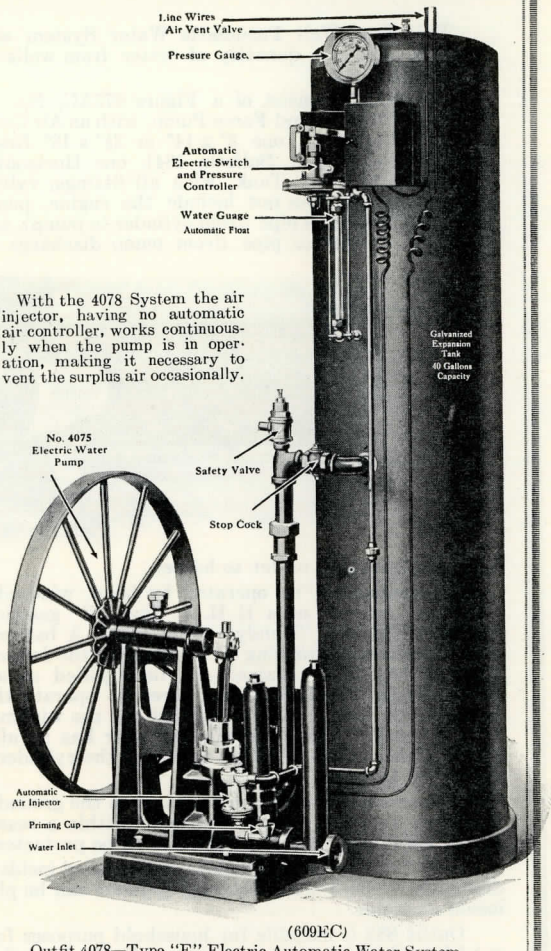
Where the pressure tank is installed near the pump, the connection between the air injector and tank is made with ¼ inch pipe. The connecting ell shown in Fig. 604EC is furnished with each injector. In case the tank is located some distance from the pump, the injector pipe can be fitted with a No. 215 ¼-inch Drexel check valve and run into a tee placed in the water discharge piping near the pump. This arrangement works perfectly, the air from the injector being carried into the tank with the water.

With the 4078 System the air injector, having no automatic air controller, works continuously when the pump is in operation, making it necessary to vent the surplus air occasionally.



Patented (1829)

The **Automatic Electric Switch,** by means of the Pressure Controller, automatically stops motor when desired pressure has been pumped into the pressure tank and automatically starts motor after a certain amount of water is used. It is suitable for direct current motors up to ½ H. P., for single-phase alternating current motors up to 2 H. P. The pressure controller, the bottom of which is connected to the tank, is easily adjusted for maximum pressures of from 25 to 50 pounds, by means of an adjusting screw. The starting range at 35 pounds pressure is about 8 pounds. Automatic Electric Switch and Pressure Controller is enclosed in a galvanized iron box, which with a cut-out switch is supplied mounted on a 9 x 14 inch wood panel. The tank connection is for ¼-inch pipe. This equipment is included with each outfit.



(609EC)

Outfit 4078—Type "E" Electric Automatic Water System

Specifications of Type "E" Electric Automatic Water Systems, with Tank and Sub-Base

Outfit Number.	Capacity, Gallons, per hour.	Maximum Vertical Height Water can be Pumped at 35 pounds Pressure, Feet.	*Maximum Vertical Suction Lift.	Expansion Tank, Galvanized.				Suction, Size Pipe, Inches.	Tank Discharge, Size, Inches.	Height Over All, Inches.	‡Motor Size, Horse Power.	Floor Space, Inches.	Approx. Shipping Weight, Pounds.	Code Words.
				Diameter, Inches.	Height, Inches.	Capacity, Gallons.	Tappings, Inches.							
4077	150	80	15	14	60	40	1	1¼	1	62	¾	29x-33	560	Usurp
4078	150	80	15	14	60	40	1	1¼	1	62	¾	29x-33	560	Usury

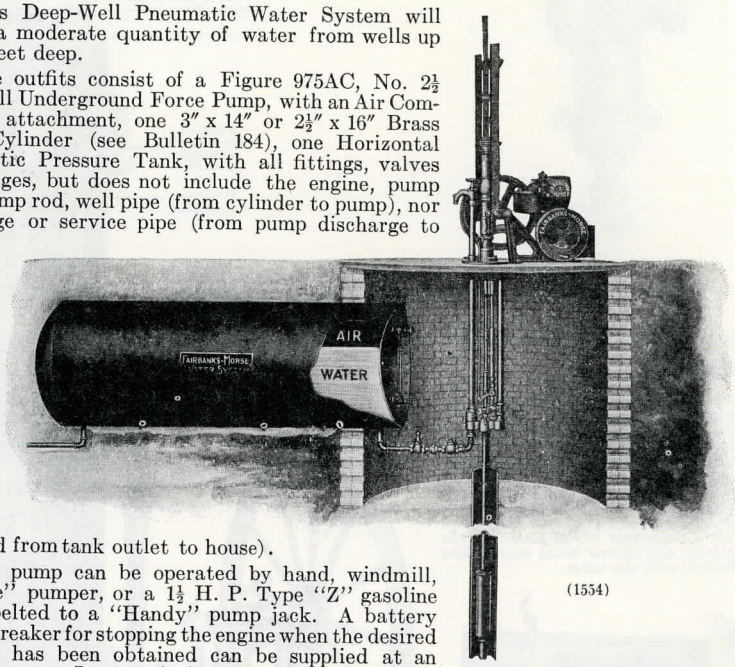
*The suction lift can be increased up to 25 feet if a good foot valve and strainer is used.
‡Specify whether direct or alternating current motor is wanted; state voltage if direct current and voltage and cycles if alternating.

Combination Deep-Well Pneumatic Water System

Hand, Windmill or Engine Drive

This Deep-Well Pneumatic Water System will supply a moderate quantity of water from wells up to 100 feet deep.

The outfits consist of a Figure 975AC, No. 2½ Windmill Underground Force Pump, with an Air Compressor attachment, one 3″ x 14″ or 2½″ x 16″ Brass Tube Cylinder (see Bulletin 184), one Horizontal Pneumatic Pressure Tank, with all fittings, valves and gauges, but does not include the engine, pump jack, pump rod, well pipe (from cylinder to pump), nor discharge or service pipe (from pump discharge to tank and from tank outlet to house).



(1554)

The pump can be operated by hand, windmill, "Eclipse" pumper, or a 1½ H. P. Type "Z" gasoline engine belted to a "Handy" pump jack. A battery circuit breaker for stopping the engine when the desired pressure has been obtained can be supplied at an extra charge. In case it is desired to operate the pump with windmill, a regulator can be supplied which will cut out the windmill when the desired pressure has been reached. The brass tube cylinder has an all-brass, two-leather plunger and patent check valve. Always submerge the cylinder in water with one length of pipe below the cylinder.

The pneumatic tank can be placed in the ground, as suggested in the illustration, or it may be placed in the basement within a reasonable distance from the pump. In all cases both tank and pipes should be protected from frost.

A 2½-inch flush cap cylinder can be placed inside of wells as small as 3-inch inside diameter. The 3-inch flush cap cylinder can be placed in wells as small as 4-inch inside diameter.

Outfit 882 is suitable for household purposes for a small family. Outfit 887 is good for suburban water service and Outfit 889 is best for farm service.

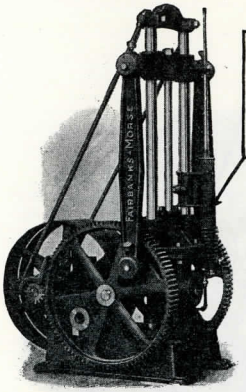
Combination Deep-Well Pneumatic Water System

Outfit Number	Size Tank Diam. x Length	Capacity		Approximate Weight, Pounds
		Total Gallons	Working Gallons	
880	30″ x 8′	295	195	825
881	30″ x 10′	365	240	900
882	**36″ x 8′**	**420**	**280**	**1025**
883	36″ x 10′	525	350	1100
884	36″ x 12′	630	420	1250
885	36″ x 14′	735	490	1400
886	42″ x 12′	865	575	1850
887	42″ x 14′	1000	665	2100
888	48″ x 14′	1300	870	2520
889	48″ x 16′	1500	1000	2810

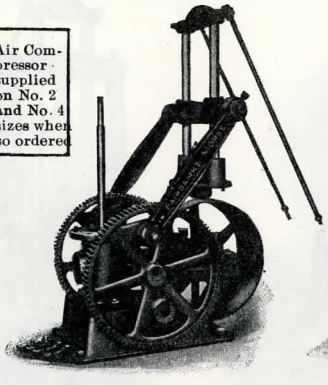
Use 1¼″ Galv. Pipe and $\frac{7}{16}$″ Galv. Steel Rod to connect pump with cylinder in well. Use 1″ Galv. Pipe to connect pump to pneumatic tank. Use 1″ Galv. Pipe for discharge from tank **underground**, and ¾″ if pneumatic tank is placed in basement.

For greater capacity in Deep Well Outfits, use power working heads shown in this catalogue, and tanks, cylinders and accessories shown in Bulletin 184.

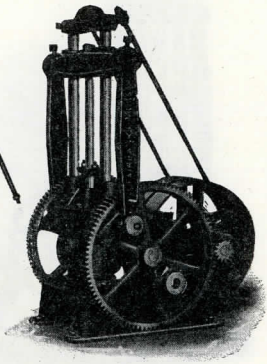
Type "H" Power Heads
For Deep Wells



No. 2 Type "H" Power Head with Air Compressor (1287M)



Showing Accessibility (1105M)



No. 4 Type "H" Power Head (1104M)

The Type "H" Power Heads are designed to operate single-acting cylinders only. They have the following valuable features:

The gearing and driving pulleys are mounted on a heavy cast iron base. The discharge tee is securely bolted to the base with two heavy machine bolts. The working parts can be removed by simply taking out two bolts, which hold the tee fitting to base, and sliding the entire head back. This advantage is appreciated when it is realized that with other makes of power heads it is necessary to raise the pipe slightly and disconnect a flange before the head can be removed.

The gears and pinions are heavy, with machine cut teeth of a wide face to insure durability under severe service. The driving pulley is placed directly behind the head between the shaft bearings. This entirely eliminates the side strain which creates a tendency to "creep" out of alignment and throw the belt, so annoying on pump heads that do not possess this valuable feature.

Another important advantage of these power heads is their accessibility. To remove the plunger and rod from the well, it is only necessary to remove the two lower nuts from the brace rods, the piston rod nut and four bolts holding the guide to tee fitting. The entire top, including guides, guide base, crosshead, and guide braces can then be raised above the piston rod and set back until they rest on the pulleys as illustrated in Fig. 1105M. This allows the use of a solid crosshead, a feature much superior to troublesome split crosshead or a removable plate.

The guide rods are generously large and pressed into the guide base in which is placed the stuffing gland. As this piece is carefully gauged there is no possible chance for the stuffing box, guides and crosshead to get out of alignment.

Sizes and Dimensions—Type "H" Power Heads, for Belt Drive

Size No.	*H. P. Capacity	Pulley, Inches	Strokes, Inches	R. P. M.	Back Geared	Piston Rod Threads		Size Pipe		Floor Space	Height, Inches	Shipping Weight, Pounds	Code Words
						Diam. Inches	Threads per Inch	Inlet, Ins.	Discharge Inches				
2	3	18x3½	10–12	30	6.33–1	1¼	8	4	2½	25x31	50	475	Defail
4	6	24x5	16–20	27	6.37–1	1⅝	8	6	4	32x42	67½	1000	Defame
8	10	30x6	20–24	25	6.1–1	1¾	8	8	6	36x48	87	2000	Defend

*When driven by Type "Z" Engines special pulleys will be required as follows: On 3 H. P. Engine 8″ x 7″; on 6 H. P. 10″ x 10″; on 10 H. P. 13″ x 12″.

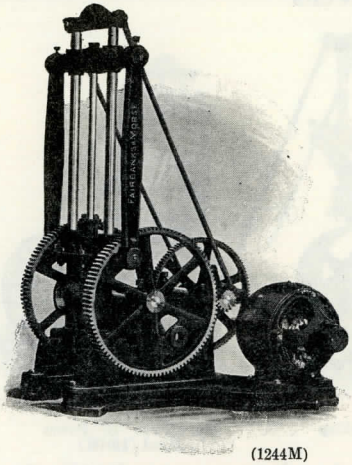
In estimating power required to operate a single-acting cylinder where a large flywheel effect is not available, bear in mind that the capacity in gallons per minute is actually pumped in half a minute. Also that greater power is required at the middle of the stroke, due to the power head moving the plunger more rapidly at that period.

When so ordered, the Nos. 2 and 4 Power Heads can be supplied with an Air Compressor attachment for use with Pneumatic Water Systems. (See Fig. 1287M).

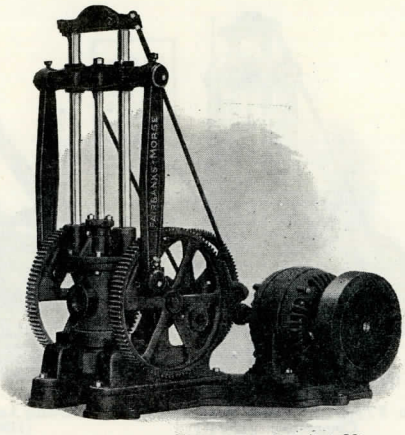
These Power Heads can be supplied with displacement plungers at an additional cost, when so ordered. No. 2 takes a 2½″ plunger, No. 4 takes a 3½″ plunger and No. 8 a 5″ plunger.

Sizes Nos. 2 and 4 can also be supplied for Windmill attachment when so ordered.

Motor Driven Type "H" Power Heads



(1244M)
No. 2 Head with 2½ H. P. Direct Current Motor



(1251M)
No. 2 Head with 3 H. P. Alternating Current Motor

Electric motors are a practical and convenient means of driving pumps used in connection with water systems or pumping installations of any kind, because they can be started or stopped by simply throwing a switch, do not require much attention and occupy very little space.

The power heads, which are fully described on page 21, are frequently used in connection with water systems where electric current is available, and to meet such conditions these working heads are supplied geared direct to electric motors. The working head and motor are both mounted on a sub-base with a rawhide pinion on the motor shaft which engages a large gear on the drive shaft of the working head, making a very compact and quiet running outfit. For the purpose of equalizing the uneven load, due to lifting the combined weight of the column of water and plunger rod on the up-stroke of the pump, the direct current motors used have compound windings, and the alternating current motors have a special rotor winding and are equipped with a balance wheel. The No. 2 and No. 4 sizes intended for use in connection with pneumatic tanks can be equipped, on special order, with an air compressor cylinder (see page 21).

Specifications—Type "H" Power Heads Direct Geared to Fairbanks-Morse Motors

Outfit Number Power Head and Motor	Type "H" Power Head—Gear Drive							Motor				Power Head and Motor, Complete			
	Size No.	Stroke, Inches	R.P.M.	Piston Rod Threads		Size Pipe		H. P.	Speed, R.P.M.	Type	Frame	Floor Space Ins.	Height Inches	Approximate Shipping Weight Pounds	Code Words
				Diam., Ins.	Threads per Inch	Inlet, Ins.	Discharge, Ins.								
Direct Current—115 or 230 Volts															
4057	2	10–12	30	1⅛	8	4	2½	2½	1325	CP	5	36x48	53	705	Smack
4058	4	16–20	27	1⅛	8	6	4	5	1100	CP	7	48x54	71	1485	Smart
4059	8	20–24	25	1½	8	8	6	10	950	CP	9L	56x70	91	3100	Smash
Alternating Current—Two or Three Phase, 110, 220, 440 or 550 Volts, 60 Cycles															
4060	2	10–12	30	1⅛	8	4	2½	3	1200	B	H8A	36x48	53	985	Smear
4061	4	16–20	27	1⅛	8	6	4	5	1200	B	H8D	48x54	71	1625	Smell
4062	8	20–24	25	1½	8	8	6	10	1200	B	H10B	56x70	91	3300	Smelt

See note on page 21 regarding power required.

(1124M)

No. 1 Power Head

The No. 1 power head is used with a 1½ H. P. engine‡ or motor where the service is too heavy for the ordinary force pump standard. Two gears and two pinions equalize the strain and insure perfect alignment for the piston rod. The pitmans are made of hard maple and are extra long to reduce the side strain to a minimum. The gears are set off center so as to raise the pitmans nearly vertical on the lifting stroke, to give greater power.

Size No.	H. P. Capacity‡	Pulleys, Inches	Strokes, Inches	R. P. M.	Back Geared	Piston Rod Threads		Size Pipe, Inches		Floor Space, Inches	Height, Ins.	Shipping Weight, Lbs	Code Word
						Dia. In.	Thr'ds Pr. In.	Inlet	Discharge				
1	1½	14x2½	5–7½–10	38	7-7-1	⅝	10	4	2½	22x22	45	180	Defag

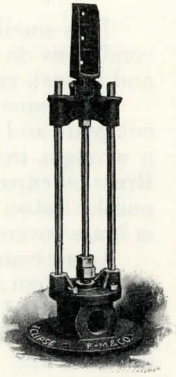
‡A special pulley 8"x4" will be required on the 1½ H.P. type "Z" Engine.
No. 1 Power Head can be supplied with air compressor attachment shown on page 21. When so ordered, No. 1 Head can also be supplied with windmill attachment.

"Eclipse" Pump Head

This pump head, No. 195AP, is fitted for a wooden pitman, 2 inches square. Cap can be taken off and sucker rod and plunger removed from well for repairs without disturbing pipe connections.

Height Over All, Inches	Diameter of Base, Inches	Stroke, Inches	*Suction Pipe, Inches	Discharge Pipe, Inches	Lower End Piston Rod, Inches	Approx. Shipping Weight, Pounds	Code Word
36	12	16	3	2	⅝ pipe thread	60	Amorous

*Suction can be bushed to 2½ or 2 inches and discharge can be made 2½ or 3 inches if specially ordered.

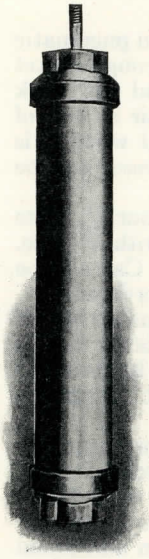


No. 195AP
"Eclipse" Pump Head

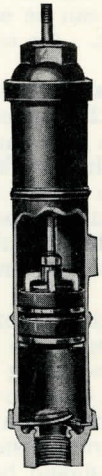
Pump Cylinders

The cylinder is the vital part of a pump. It does all the drawing and lifting and any defect in it destroys the operation or efficiency of the pump. All our cylinders are made with the greatest care. Plungers are well packed with the best tanned leather and fitted with metal poppet valve resting on a ground seat. All threads are machine cut to the exact gauge, so that all parts fit nicely. All our cylinders are fitted with a brass valve seat. Plungers are heavy and have a brass poppet with a polished iron follower, except when ordered "all brass." Standard cylinders have ample strength to pump against 125 feet head or about 55 pounds pressure. When wells are over 100 feet deep, we recommend using deep-well cylinders.

A detailed description of our full line of iron, brass lined, and brass tube pump cylinders is given in Bulletin 184, which will be gladly furnished upon request.

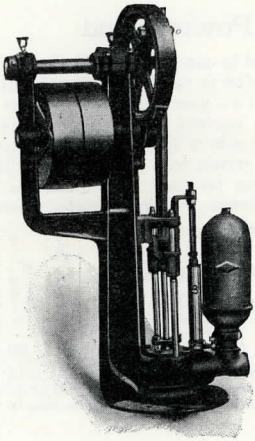


(1329)
Brass Tube
Cylinder,
Outside Caps.

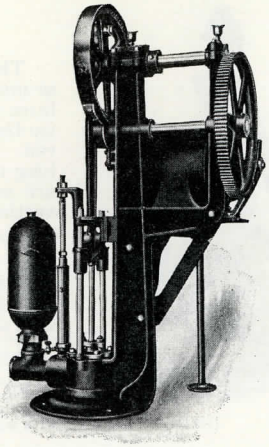


(1325)
Iron Cylinder

Light Service Deep-Well Power Head



(411AC)



(411AC-E)

This small power head is suitable for deep-well pumping where the conditions do not require over one horse power. It has 6″ and 8″ strokes and is back geared $5\frac{1}{2}$ to 1.

The frame is heavy and reinforced to withstand side strains. Machine cut gears and pinions are used throughout. The crank gear is guarded by a wrought iron cover. The $1\frac{1}{2}$″ gear shaft has split babbitted bearings. Brass oil cups supply oil to all shaft bearings. Crosshead slides on two $\frac{3}{4}$″ polished steel guides firmly supported at their upper ends. Piston rod is brass covered.

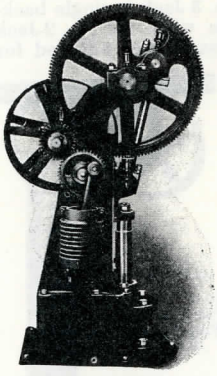
An air compressor attachment is regularly supplied for use in pneumatic water system service. This air compressor is operated by a strong bracket arm attached to crosshead and adjusted by a running thread with lock nuts so that compressor can be made to discharge all the air at end of down stroke. An air cock is provided which can be opened when it is not necessary to supply air to pneumatic tank. Air compressor can be omitted if so ordered.

Height 46″, diameter of base 14″. Base is drilled for four $\frac{1}{2}$″ bolts or lag screws. Tight and loose pulleys are 12″ diameter with 3″ face. They should run 220 R. P. M. to give 40 strokes per minute. Can also be furnished with a 24″ single pulley for motor belt drive if so ordered.

Base is tapped for 3″ drop pipe and can be bushed to smaller size if desired. Air chamber is tapped for 2″ discharge pipe. Piston rod is regularly threaded for $\frac{7}{16}$″ steel rod and $\frac{3}{8}$″ pipe thread, but can be threaded for $\frac{5}{8}$″ Box Pin Coupling without extra charge, when so ordered. Approximate weight 215 lbs.

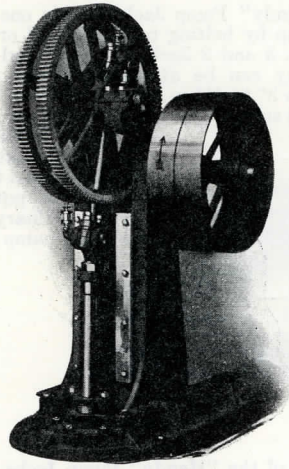
This working head can be equipped for Electric Motor drive by mounting the motor on a shelf rigidly attached to the frame as shown in Fig. 411AC-E. A shelf is furnished suitable for mounting $\frac{1}{2}$, $\frac{3}{4}$ or 1 H. P. motor. The gear and pinion have machine cut teeth to insure quiet running and the motor can be fitted with a rawhide pinion at an additional charge. Gears are proportioned so as to operate piston rod about 40 strokes per minute. The speed of the motor should be 1750 R. P. M. Approximate weight, without motor, 305 lbs.

Heavy Service Deep-Well Power Heads



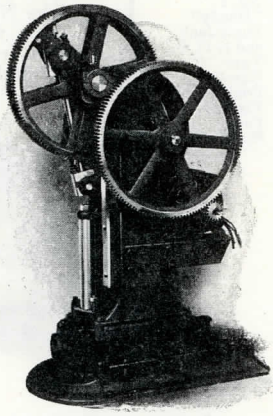
(1563)

8" Stroke Heavy Service Power Head with Air Compressor attachment and with discharge above the base.



(1565)

20" Stroke Heavy Service Power Head without Air Compressor, for discharge below the base.



(1564)

12" Stroke Heavy Service Power Head without Air Compressor, with discharge above the base and with direct connected motor drive.

These Power Heads are self contained and substantially constructed to withstand heavy service.

The driving gears are located on both sides of wrist pin and pitman so the strain is equalized. The gears and double steel pinion have machine cut cogs insuring quietness and minimum friction wear. The crosshead is extra large with wide and heavy guides. Each head has a displacement plunger. They can be used with Double Acting Deep Well cylinders to good advantage. When operated under severe conditions, and always when driven by an electric motor, a balance wheel on drive shaft and counter weights on gears must be used and are furnished at an additional charge.

In estimating the total "head" do not overlook the "Pressure" it is proposed to work against. An air cooled air compressor can be furnished, when so ordered, mounted on one side and connected to drive shaft by gears in such a way that it can be disconnected when air is not required.

Sizes and Specifications of Heavy Service Deep-Well Power Heads with Tight and Loose Pulleys for Belt Drive.

Outfit Number	Size and Length Stroke Inches	Maximum Cylinder or Largest Drop Pipe	Maximum Discharge Pipe	Maximum Head, Feet with Max. Cylinder	Size Tight and Loose Pulleys Inches	Speed Pulleys Shaft	Gear Ratio	Strokes Per Minute	Approx. Weight, Pounds	Horse Power Required	Code Words
1503	8	4"	2"	150	15x3	240	6 to 1	40	480	1	News
1504	12	5"	3"	150	18x4	240	6.8 to 1	35	980	3	Newsy
1505	16	6"	4"	150	24x4	210	7 to 1	30	1200	5	Newt
1506	20	7"	5"	150	28x5	200	8 to 1	25	2000	7½	Nexal
1507	24	8"	5"	150	30x6	200	8 to 1	25	3100	10	Next

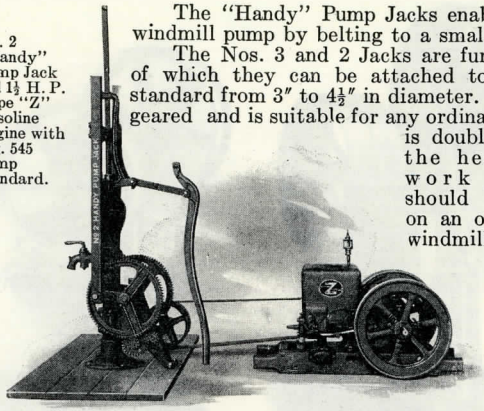
Can be fitted with single pulley when desired. The 12" stroke and larger have Sliding Bases allowing head to be slid back to remove pump rod and well valves.
These heads can be provided with discharge tee either above or below base.

Electric driven power heads have the motor mounted on the frame as shown.

There are so many engineering conditions to be considered in installing an electric driven deep-well water system that it is necessary to have detailed information before making an estimate.

State (1) size and (2) depth of well, (3) distance to water level, (4) quantity of water wanted per hour, (5) whether pneumatic tank is to be used, (6) direct or alternating current, (7) voltage and if alternating current, state (8) phase and (9) cycle.

"Handy" Pump Jacks



No. 2 "Handy" Pump Jack and 1½ H. P. Type "Z" Gasoline Engine with Fig. 545 Pump Standard.

(3244G)

The "Handy" Pump Jacks enable one to operate the ordinary windmill pump by belting to a small oil or gasoline engine.

The Nos. 3 and 2 Jacks are furnished with a clamp by means of which they can be attached to any ordinary windmill pump standard from 3″ to 4½″ in diameter. The No. 3 Jack is single back-geared and is suitable for any ordinary service while the No. 2 Jack is double back-geared and adapted for the heaviest work that should be put on an ordinary windmill pump.

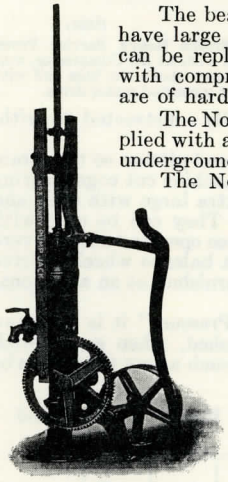
(1358M)

No. 4 "Handy" Pump Jack and Fig. 545 Pump Standard

The bearings of the "Handy" Pump Jacks have large removable babbitt bushings which can be replaced when worn and are supplied with compression grease cups. The pitmans are of hard maple.

The Nos. 3 and 2 "Handy" Jacks can be supplied with a "V" shaped clamp for attaching to underground pipe force pumps when so ordered.

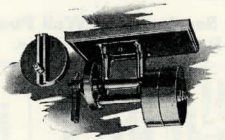
The No. 4 "Handy" Jack is particularly adapted for mounting on floor, wall or ceiling to operate any windmill pump. The No. 4-C "Handy" Jack is the same as the No. 4 except that it has a special crosshead for driving a double-acting "Handy" Force Pump.



(1286M)

No. 3 "Handy" Pump Jack with Fig. 545 Pump Standard.

The Internal Gear Pump Jack No. 514 can be fastened to a ceiling or wall to operate a common windmill pump or it can be fastened in an upright position on the well curb to operate a working head located in the well pit. As the Jack and belt can be well up out of the way, it is often used as a matter of safety in places little children are likely to frequent.



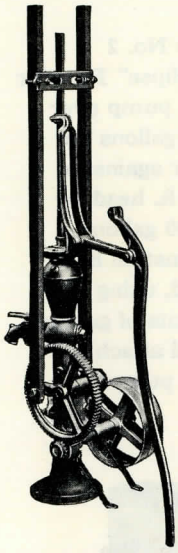
Internal Gear Pump Jack No. 514

Sizes and Dimensions—Pump Jacks—Pump and Engine not Included

Number	Type	Maximum load Jack will carry, H.P.	R.P.M. of Pump	Maximum size Cylinder and depth on short stroke. Dia. Cyl.	Head in Ft.	Length of Stroke, Inches	Number of Teeth in Gears	Ratio of Back Gearing	Pitman Length, Inches	Tight and Loose Pulleys, Inches Diam	Face	Wrist Pin, Diameter, Inches	App. Shipping Weight, Crated	Code Words Pump Jack Only
3	"Handy"	¾	32	3	100	5-7½-10	86-12	1 to 7.2	42	13	2½	1	90	Skill
4	"Handy"	¾	32	3	100	5-7½-10	86-12	1 to 7.2	42	13	2½	1	80	Skimp
2	"Handy"	1½	19	3	200	5-7½-10	86-12 / 30-12	1 to 17.9	42	9	2½	1	120	Jadit
514	Internal Gear	½	32	2¾	100	Adjustable 2-10	61-18	1 to 3.4	.....	12	3½	1¼	95	Cane

1½ H. P. Type "Z" Engine with standard pulley 6x4 will drive any of the "Handy" Jacks at rated speed.

No. 10 and No. 36 Pump Jacks



No. 10
Single Geared Pump Jack

The No. 10 and No. 36 Pump Jacks have every essential for successful operation—they are mechanically efficient, strong, durable and dependable. They can be easily attached to any ordinary windmill pump. By mounting in a horizontal position on the sub-base, the jacks may also be used with horizontal pumps. In changing over from belt power to windmill or hand, it is not necessary to detach the jack from the pump—simply remove the pin from the crosshead and connect the windmill slide or the handle.

The bearings are of cast iron, accurately bored and of generous length to insure long life. The main bearing is center bored to form an oil chamber for proper lubrication. The pulley shaft and main shaft are of $1\frac{1}{8}$" cold rolled steel, giving great strength and long wear. Pitmans are made from selected seasoned birch and operate always in true vertical position, in perfect alignment, so that there can be no side-thrust, binding or undue wear.

No. 10 Single Geared Pump Jack

Furnished with clamp for pump barrel or sub-base.

Cast gears, ratio 7 to 1; tight and loose pulleys, 12" x $2\frac{1}{4}$."

Speed for shallow wells, 40 strokes per minute.

Speed for wells 100 feet, 20 strokes per minute.

Adjustable stroke, 5", $7\frac{1}{2}$", 10".

Approximate weight with clamp, 70 lbs.; with sub-base, 80 lbs.

Approximate shipping weight with crate, 78 lbs.; with sub-base 88 lbs.

No. 36 Double Geared Pump Jack

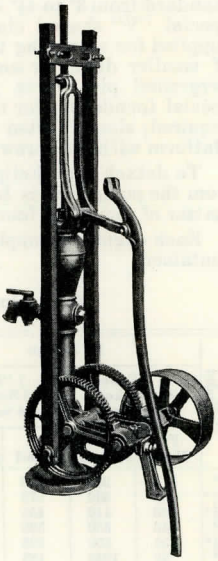
This jack is made for heavier service, built strong and durable. It embodies the same quality points as the No. 10 Jack.

Fitted with clamp to attach to base of pump and foot to support pulley-end of frame.

Cast gears, ratio 7 to 1, tight and loose pulleys 14" x $2\frac{1}{4}$".

Adjustable stroke, 5", $7\frac{1}{2}$", 10".

Approximate weight, 87 lbs.; approximate shipping weight, 95 lbs.



No. 36
Double Geared Pump Jack

"Eclipse" Pumpers

It is no longer necessary to work the old pump by hand, since the "Eclipse" pumpers are built especially for this service —to pump water when you want it, where you want it—at small expense.

The "Eclipse" Pumpers are light, well-balanced, smooth running, and can be easily moved from place to place. They are made in two sizes, the No. 1 developing about one horse power and the No. 2 developing about two horse power. The engine only can be supplied without the pump jack if desired. They are four cycle gasoline engines, with jump spark ignition, and operate at 700 R.P.M. The crank case is enclosed and dust-proof.

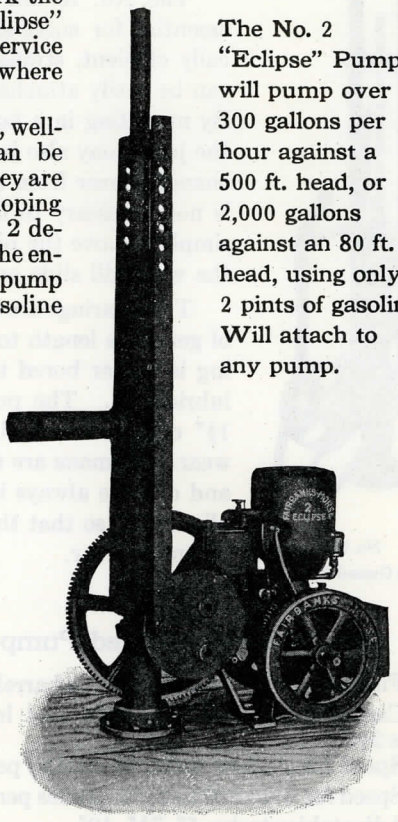
The water hoppers are so designed that they are practically frostproof; freezing of water in the hopper is not likely to break them or damage the cylinder.

All parts are well made, of good material and interchangeable.

The clamp for attaching the pumper will fit any ordinary windmill pump standard from 3″ to 4½″ in diameter. A special "V" shaped clamp can be supplied for attaching to standards of smaller diameter such as an underground pipe force pump. No special foundation for the engine is required; simply fasten to the well platform with lag screws.

To detach the "Eclipse" Engine from the pump jack is but a simple matter of removing four bolts.

The No. 2 "Eclipse" Pumper will pump over 300 gallons per hour against a 500 ft. head, or 2,000 gallons against an 80 ft. head, using only 2 pints of gasoline. Will attach to any pump.



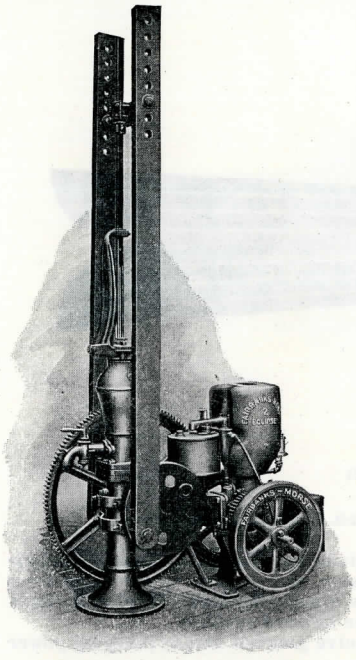
(980M)

No. 2 "Eclipse" Pumper with ordinary well casing used in place of a pump standard

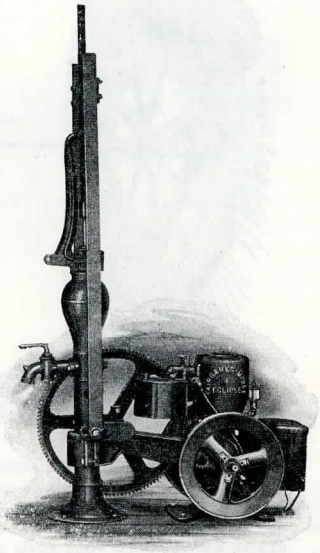
Each engine is complete with battery box, spark coil and gasoline tank, all self-contained.

Approximate Pumping Power of the "Eclipse" Pumpers

Diameter Cylinder	10″ Stroke				7½″ Stroke				5″ Stroke			
	No. 1 "Eclipse" 32 Strokes per minute		No. 2 "Eclipse" 28 Strokes per minute		No. 1 "Eclipse" 32 Strokes per minute		No. 2 "Eclipse" 28 Strokes per minute		No. 1 "Eclipse" 32 Strokes per minute		No. 2 "Eclipse" 28 Strokes per minute	
	Ft. Head	Gals. per hour	Ft. Head	Gals. per hour	Ft. Head	Gals. per hour	Ft. Head	Gals. per hour	Ft. Head	Gals. per hour	Ft. Head	Gals. per hour
2″	315	260	720	230	420	195	958	171	630	130	.....	.....
2¼″	250	330	570	290	300	275	685	240	500	165	.....	.....
2½″	200	410	455	360	265	310	605	272	400	205	912	180
3″	140	580	320	510	186	440	424	385	285	290	650	254
3½″	100	800	228	700	136	600	310	525	205	400	468	350
4″	80	1040	183	910	105	780	240	683	156	520	356	455
4½″	.....	.....	160	1030	.....	.....	220	720	.....	.....	280	580
5″	.....	.....	105	1540	.....	.....	150	1072	.....	.....	185	867
6″	.....	.....	80	2060	.....	.....	115	1428	.....	.....	140	1156



(1210M)
No. 2 "Eclipse" Pumper and Fig. 216BC Pump Standard



(3032G)
No. 1 "Eclipse" Pumper and Fig. 545 Pump Standard

No. 1 "Eclipse" Pumper for Farm-Well Pumping

Capacity up to 1,000 gallons of water per hour, depending on size and type of pump used. Engine can also be used for running cream separator, washing machine, etc. Can be supplied with or without Pump Jack. Uses about one pint of gasoline per hour on full load.

No. 2 "Eclipse" Pumper for Deep-Well Pumping

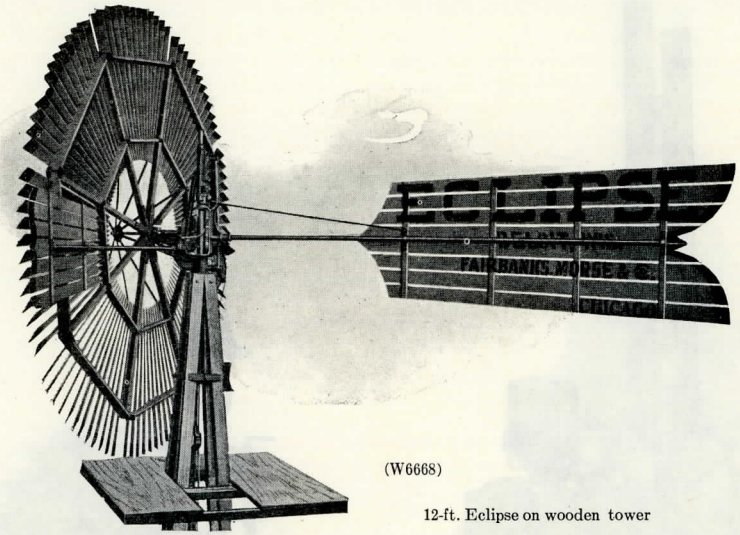
Capacity up to 2,000 gallons of water per hour, depending on size and type of pump used. Engine can be used for running a cream separator, washing machine or small churn, wood saw, small ensilage cutter, etc. Can be supplied with or without Pump Jack. Uses about two pints of gasoline per hour on full load.

Specifications of No. 1 and 2 "Eclipse" Pumpers

Engine Number	Outfit Number	Approximate Horse Power	Speed, R. P. M.	Belt Pulley Size in Inches		Flywheel Size in Inches		Capacity Fuel Tank Gallons	Water Hopper Capacity in Gallons	*Approximate Shipping Weight In Pounds	Code Words
				Diameter	Face	Diameter	Face				
1	807	1	700	4	2½	14	1⅜	¾	1	250	Calla
2	1170	2	700	5	4	16	1¾	1.2	3¾	510	Caddis

*No. 1 "Eclipse" without Jack weighs 190 pounds.
No. 2 "Eclipse" without Jack weighs 340 pounds.

Eclipse Wood Windmills



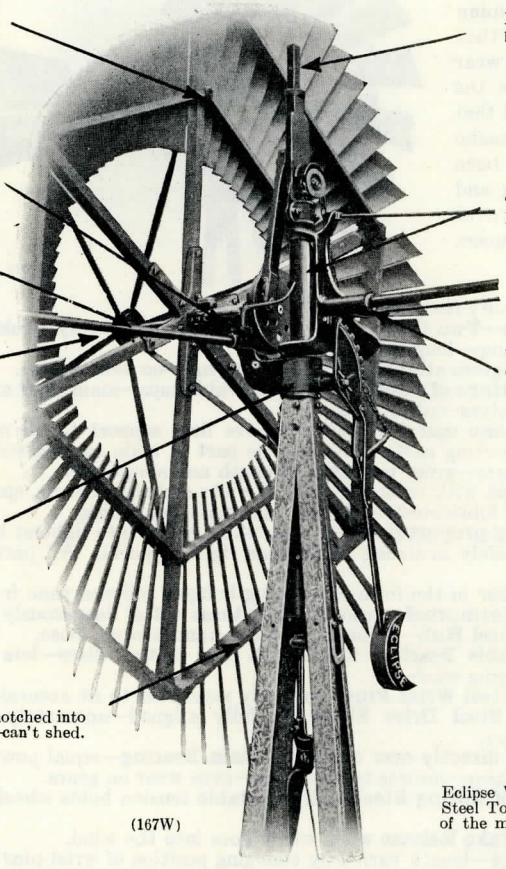
(W6668)

12-ft. Eclipse on wooden tower

The constant economical pumping service given by "Eclipse" Windmills—year in and year out—is the result of practical design and skillful construction from durable materials. Here are 24 important facts about "Eclipse" Windmills, each one contributing its share to the supremacy of the finished product.

1. **Main Vane** set so that sails are held to receive greatest steady pumping power from wind at all speeds.
2. **Regulating Side Vane** gives easy positive movement in and out of wind. Makes mill run safely in strong winds—sensitive to light breeze.
3. **Direct Stroke** gives greatest power applied direct to pump—no gears.
4. **Practically Stormproof.** Automatically turns out of wind when wind becomes violent.
5. **Large Oil Wells,** filled with absorbent, keep all parts thoroughly lubricated for a long time. This slow speed mill requires but little oil.
6. **Noiseless,** being direct stroke—solid wheel—few parts.
7. **Stroke Change.** Length varied by changing position of wrist pin on face plate.
8. **Adjustable Bearings,** with removable caps, babbitted. Main shaft bearings and upper piston guide also babbitted.
9. **Friction Brake** on face plate locks wheel when out of wind, to prevent pump dribble.
10. **Automatic Brake Release** when wheel gets in wind.
11. **Shock Absorber** prevents damage to wheel and vane.
12. **Large Turntable Bearing,** fitted with easy motion discs, reduces friction.
13. **Strong Main Frame** provides a firm working base.
14. **One Piece Wheel Hub** pressed on shaft; wheel arms bolted in sockets; can't work loose.
15. **Wheel Parts all Rigidly Built Together.** Sails firmly held in girts, making self-bracing sections; cannot shed sails; girts bolted to wheel-arms; have protecting clips; sections cannot work loose.
16. **Rock Maple Pitman,** oil treated; stands more jar and wear than any other material.
17. **Unusual Strength** from tough, well seasoned wood, selected for work to be done, carefully painted, steel braced.
18. **Speed Adjustment** allows of easily changing wheel speed for light or heavy work.
19. **Steel Piston Rod** operates without bending or rubbing against pivot casting.
20. **Steel Tapered Wrist Pin,** carefully machined to fit; cannot work loose.
21. **Steel Pipe Vane Bars,** with truss braces, to give ample strength with light weight.
22. **Wheel Lock** holds wheel out of wind when pulled out **from below.**
23. **Long Life**—Simple, few parts, slow speed, steady motion—mean little wear.
24. **Guaranteed** by over fifty years of windmill experience and Fairbanks-Morse quality.

"Eclipse" Wood Windmills



(167W)

Eclipse Windmill on No. 2 Steel Tower—showing a few of the many big features

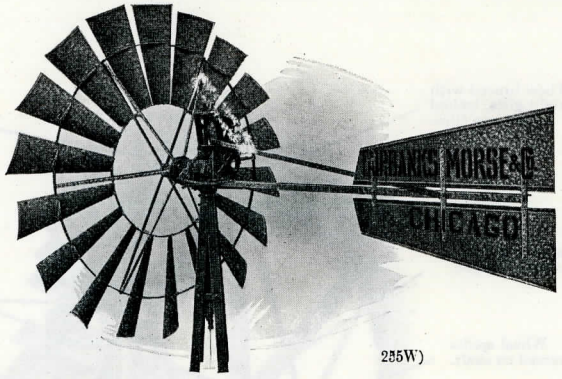
Diameter Wind Wheel, Feet	Nominal Strokes Inches	Approximate Domestic Weight, Pounds	Approximate Weight for Export, Pounds	Cubic Feet	Code Word
8½	4 and 4	435	432	20	Acix
10	4, 5, 7 and 8	520	676	49	Aciform
12	4, 5, 7, 8 and 10	710	951	70	Acinose
14	6, 7, 8 and 10	1045	1395	90	Acinus

For larger Eclipse Windmills, up to 25 feet diameter, see Bulletin H159.

When ordered without a tower, they are always shipped with fittings for a four-post wood tower, unless otherwise specified. They can be fitted for Fairbanks-Morse steel towers. With the windmill are shipped the tower collar and step and necessary bolts to fasten same on any of the above mentioned towers. Sufficient wood pump pole is also included for a 40 or 50-foot tower, together with a connection for the pump. Full instructions for erecting are furnished with every Eclipse.

Type "M" Steel Windmills

The Type "M" is a slow speed backgeared steel windmill—a simple smooth-running pumping unit—with no part that can shake loose or wear out quickly. It is the best steel windmill that we know how to make—and we have been manufacturing and selling windmills for over 50 years—are pioneers in the business.



235W)

Note these quality features:

1. **Two Pitmans—Two Gears**—means equalized load—steady stroke—less strain on mill and pump—long life.
2. **Center Lift**—gives straight pull on piston rod—no side strain.
3. **All Main Bearings of babbitt** with removable caps—main shaft and crankshaft bearings in halves—adjustable.
4. **Main Frame one massive casting**—gives firm support to all moving parts. Principal supporting parts being cast as part of main casting reduces number of separate parts—gives increased strength and simplicity.
5. **Large Oil Cups** with twisted wire feed wicks and steel covers, spring retained, keep all parts lubricated for a long time with one filling.
6. **Vane carefully proportioned**—swings wheel easily into lightest breeze—keeps mill running safely in strong winds—has rigid supports. All parts thoroughly galvanized.
7. **Shock Absorber** in the form of a spring bumper relieves vane from jar.
8. **Practically Stormproof**—automatically turns out of dangerously high wind.
9. **One-piece Wheel Hub**—pressed on shaft—cannot work loose.
10. **Large Turntable Bearing,** fitted with easy motion discs—lets wheel swing easily to changing wind.
11. **Cold Rolled Steel Wrist Pins**—carefully machined to fit accurately.
12. **Cold Rolled Steel Drive Shaft** carefully aligned—accurately sized—made unusually strong.
13. **Wheel placed directly over center of Main Bearing**—equal power being thus given to each gear—insures true running—even wear on gears.
14. **Band Brake of Spring Steel** with adjustable tension holds wheel firmly when out of wind.
15. **Automatic Brake Release** when wheel goes into the wind.
16. **Stroke Change**—length varied by changing position of wrist-pins in gears.
17. **Rock Maple Pitmans**—stands more jar and wear than any other material—reinforced at ends.
18. **Gear Guards**—keep gears free from ice and snow—retain oil.
19. **Substantial Wheel Construction**—all parts fastened firmly together, and thoroughly galvanized.
20. **Wide Strong Sails**—receive full driving force of wind.
21. **Wheel Lock**—holds mill out of wind when pulled out **from below.**
22. **Square holes in wheel hub and square shank bolts** prevent loosening of wheel arms.
23. **Long Life**—simple—few parts—steady motion—mean little wear.
24. **Guaranteed** by over 50 years of windmill experience—and Fairbanks-Morse quality.

Sizes and Dimensions of Fairbanks-Morse Type "M" Steel Windmills

Diameter Windmill, Feet	Nominal Strokes, Inches	Weight Domestic, Pounds	Code Word
8	4, 6 and 8	385	Choir
10	5, 7½ and 10	600	Choke

Type "M" Steel Windmills are shipped with the same fittings as those furnished with Eclipse Mills.
See specifications on page 31.

The power from the Type "M" wheel is transmitted through two small pinion gears in mesh with two larger crank gears which turn at correct slow speed for steady pumping. **A wrist pin of cold rolled steel** is securely fitted on the outer side of each crank gear and one end of each **rock maple pitman** works on this pin. The other ends of the pitmans work on a cold rolled steel crosshead shaft which also passes through the rocker arm and the end of the pump pole.

The piston is placed in the exact center of this shaft, directly over the pump. This **CENTER LIFT** divides the work evenly between the two gears— insures a steady, even pumping stroke, without side strain on any part— and thus lengthens the life of the windmill, and the tower and pump as well. **Steel guards** over each gear effectively keep out snow, sleet, ice, etc., and retain the oil.

The vane of the Type "M" Windmill is set at exactly the right distance away from the wheel to give **perfect regulation.** It is made light and strong, of sheet metal riveted on two steel bar supports. It is hinged to the frame of the mill, the two supports being set far apart and kept in exact alignment by a long hinge pin which extends from one vane support to the other.

The spider casting is so designed that the center of gravity of the wheel is **directly over** instead of outside of the wheel bearing. This distributes the weight of the wheel evenly—results in perfect alignment, reduced wear and longer life.

A governor spring which is extended from one end of the vane bar to the main frame of the mill holds the wheel steady in the face of strong winds but allows the wheel to turn out of winds high enough to be violent. As soon as the wind dies down to a safe degree the spring will again pull the wheel into position for pumping. Thus the Type "M" is **practically stormproof.**

The main frame is a single casting, so designed that extensions from it form the rocker arm support—the vane hinge lugs—pullout chain sheaves—shock absorber base—governor spring lug and the attachment point for the band brake connection. Thus the number of separate parts is reduced—the use of bolted attachments is avoided and **increased strength and simplicity** is secured. This casting has been developed by the most skilled moulders in our large power machinery factory and is without an equal in the windmill field.

The weight of the wheel and vane is practically balanced on a cast-iron collar which holds the windmill pivot. Several steel washers are placed between these— therefore the **mill swings easily** on the pivot to take advantage of the slightest change of wind. All important bearings are supplied with **large oil wells** having twisted wire wick feeds which insure a constant supply of oil from the cup to the bearing.

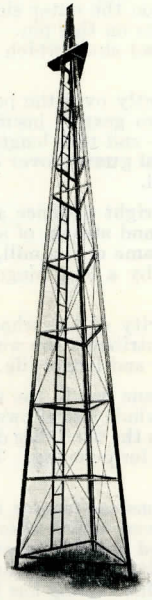
The bearing shafts are made of cold rolled steel accurately machined and ground to fit perfectly—giving great strength, a minimum of friction and consequently more pumping power. All important bearings are babbitted accurately with caps bolted in place.

The bearings are all made especially long for the work to be done, thereby reducing wear and insuring long life. Paper liners are placed between the bearing and cap of the main shaft and crank shaft bearings and if the bearings become worn from long use, these paper liners can be removed, the nuts tightened and the bearings will fit as accurately as when new.

The hole in the spider is made a trifle smaller than the diameter of the driving shaft. It is forced on the shaft in our factory under pressure of many tons. The spider is then keyed to the shaft. A spring cotter through end of shaft also aids to prevent the key from working out. For this reason a Type "M" wheel can **never be blown off** the drive shaft or even become loose.

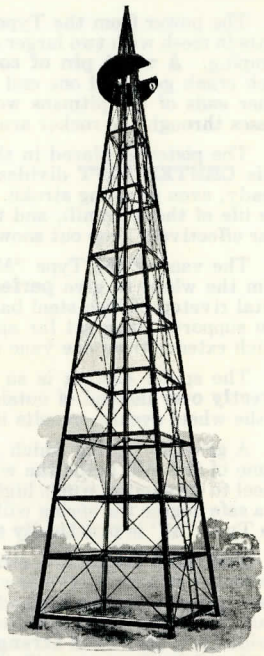
The Type "M" wind wheel arms are even in number and are placed directly opposite each other, so that the wheel is perfectly balanced and equal support is given to the rim all the way around. The arms are of heavy flat steel braced with crossbars. Each is securely held in place by two square shank bolts fitted tightly into square holes in the wheel spider and fastened permanently with lock nuts—so the bolts can neither turn nor loosen. Since neither the arms nor rims can work loose, Type "M" wheels can withstand a terrific wind pressure and never collapse.

Galvanized Steel Windmill Towers



No. 0—40-ft. 3-post Tower, Girts 5 feet apart. For 8 and 8½-ft. mills

No. 1—50-ft. Tower, Girts 5 ft. apart. For 8 and 8½-ft. mills. 2 inch by 2 inch angle corner post



No. 2—50-ft. Tower, Girts 5 ft. apart. For 8, 8½ and 10-ft. mills. 2½-inch by 2½-inch angle corner post

The Fairbanks-Morse Galvanized "All-Steel" towers have proven universally satisfactory. The No. 2 All-Steel Tower is so far in advance of others that it practically stands without a competitor. The No. 1 Tower, while lighter than the No. 2, has never been equaled for strength at the price. The No. 0 Tower is furnished to customers who prefer a three-post tower.

A windmill tower includes the corner posts, girts, braces, pole guides, ladder, platform and anchor posts. Tower collar, step casting and pump poles are not shipped with tower, but with windmill. If collar, step or pump poles are ordered with a tower, without windmill, they are charged for as an extra.

We can also furnish Steel Stub Towers for placing our mills on old wood towers, on a barn, or in an elevated tank on a substructure. For this purpose we recommend a stub tower 4 feet long for 8 and 8½ ft. mills, 5 feet long for 10 ft. mills, and 6 feet long for 12 ft. mills.

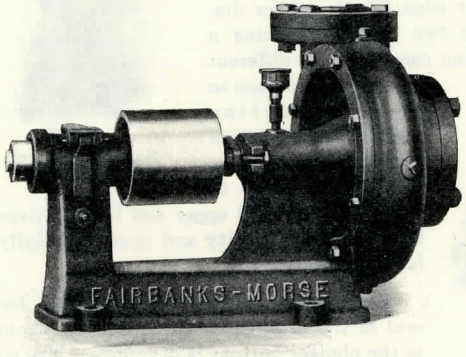
No. 0—Three-Post Tower for 8 and 8½-ft. mills.			No. 1 Tower, for 8 and 8½-ft. mills		No. 2 Tower for 8, 8½ and 10-ft. mills		*No. 3 Tower for 12-ft. mills.		No. 4 Tower for 14-ft. mill	
Nominal Ht., Ft.	Approx. Weight, Pounds	Code Word	Approx. Weight, Pounds	Code Word	Approx. Weight, Pounds	Code Word	Approx. Weight, Pounds	Code Word	Approx. Weight, Pounds	Code Word
20	230	Poultry	280	Beck	340	Beast	410	Boagel	650	Bridle
30	355	Pommel	420	Becker	500	Beach	650	Boar	1150	Brief
40	520	Poet	600	Beckon	700	Beacon	950	Boarded	1300	Briefly
50	705	Porpoise	900	Becket	1000	Beada	1200	Boards	1700	Brier
60	955	Porcupine	1180	Becked	1350	Beadle	1600	Boarish	2250	Briered
70	.....	.....	.....	.....	1880	Beaham	2150	Boast	2700	Briery
80	.....	.....	.....	.....	2500	Beak	2745	Boasted	3350	Brig

*When ordered the No. 3 Tower can be furnished for 10-ft. mill.

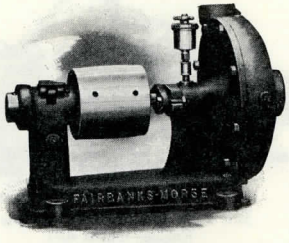
Fairbanks-Morse Centrifugal Pumps

Open Impeller, Single Stage, Side Suction Moderate Head Centrifugal Pumps

These open impeller centrifugal pumps have been developed with the idea of placing before the pump using public a rugged, durable and efficient pump at a very moderate price.



(816CE)
3-inch Pump with Flanged Suction and Discharge Openings



(779CE)
1½-inch Pump with Tapped Suction and Discharge Openings

Quantity production with complete jigs and special tools assure the customer of a well built and smooth running pump at a moderate price, as well as the possibility of obtaining accurate fitting repair parts.

These pumps are suitable for heads up to and including 65 feet and are adaptable for general service in industrial plants and for water supply

Sizes and Capacities

Open Impeller, Single Stage, Side Suction, Moderate Head Centrifugal Pumps

No. of Pump and Size of Discharge, Inches	Size of Suction, Inches	Standard Pulley		Capacity in U. S. Gals. per Min.			Approx. Shipping Weight, Pounds	Code Word
		Diam. Inches	Face Inches	Minimum	Normal	Maximum		
1	1½	4	3	20	30	40	42	Nide
1½	2	4	4	40	60	80	96	Nidnog
2	2½	5	5	80	100	150	152	Nidose
2½	3	5	5	125	175	250	165	Niello
3	3½	5	5	180	250	350	173	Nig

These pumps are furnished for belt drive only, and for left-hand rotation when viewed from suction end.
The 1″ and 1½″ sizes are provided with tapped suction and discharge openings.
The No. 2 and larger sizes are provided with flanged suction and discharge openings; companion flanges, with bolts and gaskets, being furnished with each pump.

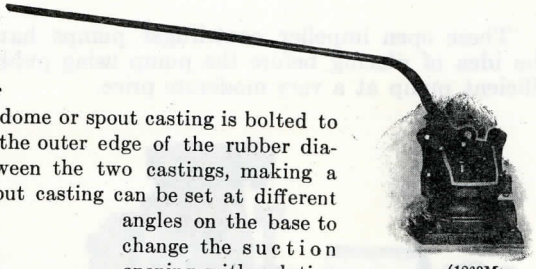
Speed Table

Speed in revolutions per minute required for various heads to deliver normal capacity.

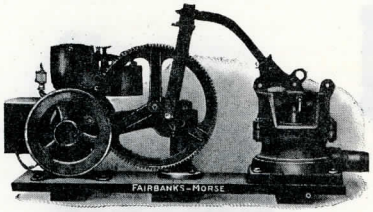
Size Pump	Heads, in Feet					
	10 Feet	20 Feet	30 Feet	40 Feet	50 Feet	60 Feet
1	1050 R.P.M.	1500 R.P.M.	1800 R.P.M.	2050 R.P.M.	2300 R.P.M.	2500 R.P.M.
1½	850 "	1040 "	1225 "	1385 "	1550 "	1700 "
2-2½-3	750 "	950 "	1150 "	1275 "	1375 "	1500 "

Fairbanks-Morse Trench Pumps

These Diaphragm Trench Pumps have a capacity of $\frac{2}{3}$ gallons per stroke for the No. 2, and $1\frac{1}{2}$ gallons per stroke for the No. 3. The dome or spout casting is bolted to the base with three bolts, the outer edge of the rubber diaphragm being clamped between the two castings, making a water tight joint. This spout casting can be set at different angles on the base to change the suction opening with relation to the discharge spout. The **rubber used** in the diaphragm and upper and lower valves is of the **best quality** and made especially for this purpose.



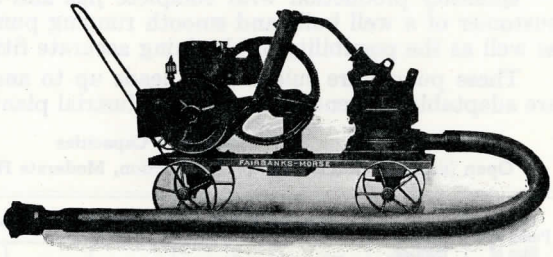
(1260M)
No. 2 Pump, Hand Power—Outfit 4035



(3185G)
No. 2 Pump and No. 1 "Eclipse" Engine—Outfit 4031

The plunger bottom is machined for seat of top or plunger valve and the hole in the plunger bottom is of sufficient size so the **lower valve can be pulled up through the plunger.** Both valves are accessible for inspection at any time as a stop pin in the crosshead serves as a stop for the upper valve and can be raised out of the way so that upper and lower valves can then be taken out for inspection.

The operating lever can be set for operation on right or left hand side of pump and the steel hand lever can be used in either horizontal or vertical position. The steel hand lever can be slipped through the loop in the operating lever for carrying the pump.



(3188G)
No. 3 Pump and No. 1 "Eclipse" Engine—Outfit 4034

Outfit No.	TRENCH PUMP OUTFITS	Approx. Shipping Weight, Pounds	Code Word
4031	No. 2 Trench Pump Direct Connected to No. 1 "Eclipse" Gasoline Engine...	500	Cabot
4032	No. 3 Trench Pump Direct Connected to No. 1 "Eclipse" Gasoline Engine...	580	Cabog
4033	No. 2 Trench Pump Direct Connected to No. 1 "Eclipse" Gasoline Engine.. mounted on hand truck.....	600	Cymbal
4034	No. 3 Trench Pump Direct Connected to No. 1 "Eclipse" Gasoline Engine mounted on hand truck.....	685	Cypress
4035	No. 2 Trench Pump only, with 3" side suction opening.....	185	Payer
4036	No. 3 Trench Pump only, with 4" side suction opening.....	225	Pavan

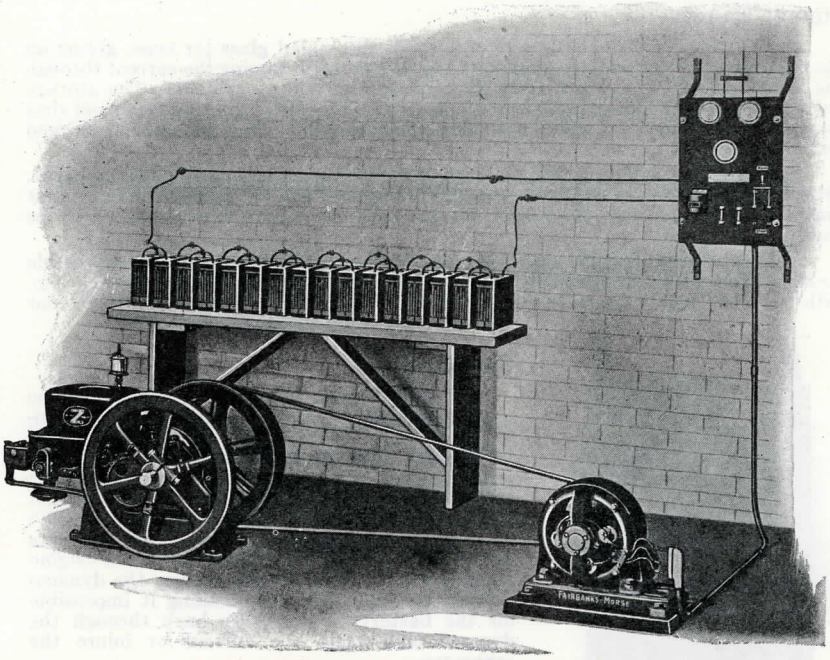
Suction hose can be supplied either with pump or separate, in lengths of 10, 12, 15 or 20 feet with a pipe nipple wired into each end.

When **Suction Equipment** is ordered with a Trench Pump outfit the equipment regularly furnished (unless otherwise specified) consists of the following:

For outfits 4031, 4033 and 4035—15 feet of three inch smooth bore suction hose with nipple wired into each end, foot valve and strainer.

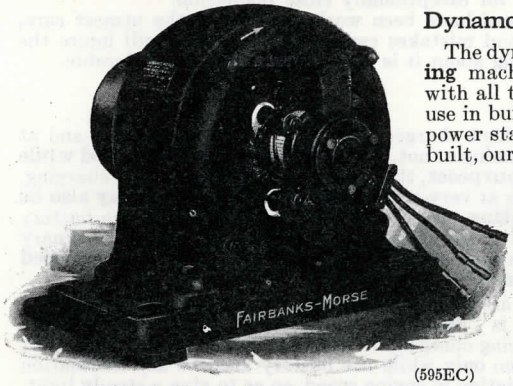
For outfits 4032, 4034 and 4036—20 feet of four inch smooth bore suction hose with nipple wired into each end, foot valve and strainer.

Type "F" Light and Power Plants
Operated on Kerosene



Type "F" Lighting Plan with "Z" Engine (622EC)

A Fairbanks-Morse Type "F" electric light plant consists of a kerosene engine, a dynamo, a switchboard and a storage battery. The plant is designed to operate 30 volt metallic filament lamps, commonly called Mazda lamps. These lamps are standard, and can be obtained in 10, 20, 40, 50, 75 and 100-watt sizes, giving 8, 16, 32, 55, 88 and 125 candle-power respectively. The 20-watt 16 candle-power lamp is the most common, and is used as the basis for rating our plants.



Fairbanks-Morse Ball-bearing Dynamo (595EC)

Dynamo

The dynamo is a **multipolar ball-bearing** machine, designed and constructed with all the care and refinement that we use in building machines for the largest power stations. It is heavily and sturdily built, our aim being to produce a machine of liberal rating which will not only require the smallest possible amount of care and attention, but will continue to give satisfactory and efficient service for many years.

As there is practically no friction in the ball bearings, the machine runs easily, without wear, and requires little attention, as one packing of the bearings with grease will provide perfect lubrication of the bearings for a long time. The current generated is of low voltage, and is entirely harmless, so that no unpleasant results follow even if accidental contact is made with uninsulated parts of the machine.

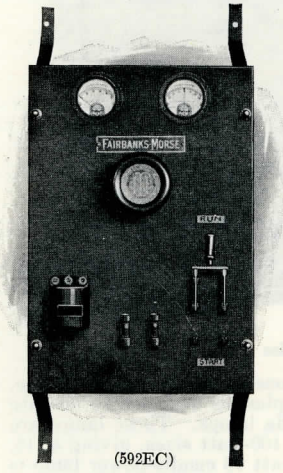
Type "F" Light and Power Plants

Storage Battery

The storage battery consists of 16 cells of the sealed glass jar type, giving an average voltage of 32, which allows for a loss of 2 volts for forcing the current through the wires and gives approximately 30 volts at the lamp terminals. The storage battery is one of the most important elements of a successful lighting plant and that selected for the Type "F" plants is of the highest quality. They are shipped charged and ready for use.

They are furnished in four sizes, with capacities as given in the following pages. From a consideration of the number of lights required and the number of hours that they will burn each day, the proper size for each customer's requirements may be readily determined.

While recommending the sealed glass jar batteries, because the interior is visible for inspection, we are prepared to furnish the more common rubber jar batteries also, with the same high quality of plates. Rubber jar batteries are assembled in four wooden trays, each containing four cells.



(592EC)

Type "FS" Switchboard with Self-starting Switch

Switchboard

The switchboard is a simple and handsome panel, equipped with the highest grade instruments known. There is but one switch, **which is thrown downward to start the plant** and then thrown upward to run. An automatic circuit breaker or cutout, closes the circuit and starts the battery charging when the dynamo voltage reaches the proper value. It also cuts out, or disconnects the dynamo when the engine shuts down, or, when for any reason, the dynamo voltage becomes low, thus making it impossible for the battery to discharge back through the dynamo and waste the current or injure the apparatus.

There is a voltmeter and an ammeter which indicate the voltage and amperes of the charging current, and a dynamo regulator, or rheostat, mounted back of the board with a hand wheel in front, by means of which the charging current is is regulated. This rheostat has an unusually large number of contact points, thus providing for exceptionally close regulation.

The details of this switchboard have been worked out with the utmost care, so that it is simple to operate, and mistakes cannot be made that will injure the apparatus in any way. Everything about it is simple, substantial and durable.

Operation

When the storage battery is kept charged, light may be had anywhere and at any time, whether the engine is running or not. **The battery may be charged while the engine is running for other purposes,** the surplus power being used for charging, thus providing current for lighting at very small expense. **The engine may also be used independently of the lighting plant.** In many cases charging the battery once or twice a week will be sufficient to furnish all the current required for ordinary service. The charging current may be regulated to give the battery a **"tapered charge"**—which means higher capacity and longer life to the battery.

When a large number of lights are required, the output of the battery and dynamo may be combined. The battery is "floated on the line," as it is called. Lights may be run while the battery is being charged, or the plant may be regulated so that lights will be run from the dynamo only while the battery absorbs any fluctuation in voltage that may be due to variation in engine speed, so as to give a steady light. **Light may be had all the time.** While the engine is shut down the battery will take up the load and carry the lights without requiring any manipulation of the switches, and when the engine is started up the battery may be charged and lights run from the dynamo as desired. The plant is thus extrenely flexible in operation.

Floating

When we say a battery is floating, it means that the battery is connected to the line while the dynamo is running, but is neither charging or discharging to any considerable extent. When so connected, the battery absorbs any irregularities in the current caused by speed fluctuation of the engine, and gives a steady light. Also if lights are turned off, the battery will take the surplus current generated by the dynamo and charge, while if more lights are turned on, the battery will discharge and furnish the current for them.

3 H. P. 50 Light Plant

Capacity in Sixteen candle power lamps, consuming 20 watts each

50 lights for 5 hours—Dynamo running and battery fully charged.
19 lights for 5 hours
13 lights for 8 hours } Battery only (when fully charged).
32 lights as long as wanted—Dynamo running and battery floating.

This outfit has 2 H. P. surplus power that may be used for other purposes while battery is charging.

Specifications for Type "F" Electric Light Plant with 3 H. P. Fairbanks-Morse Type "Z" Oil Engine

Outfit No. 4065SB Code word, Affy

1 900 watts, 30 to 42 volts, multipolar, shunt wound, BALL-BEARING DYNAMO.
16 cells Sealed Glass Jar Storage Battery (66 ampere hours), with Hydrometer Syringe.
1 type "FS" Switchboard.
1 3 H. P. Type "Z" Hopper-cooled Oil Engine with built-in oscillating Magneto, Compression Relief Device and 18″ x 3″ Steel Split Pulley.
The engine may be operated on either kerosene or gasoline.

Outfit No. 4066SB Code word, Afric

Same as above, but without engine. Can be operated from any engine or line shaft.

3 H. P. 65 Light Plant

Capacity in Sixteen candle power lamps, consuming 20 watts each

65 lights for 5 hours—Dynamo running and battery fully charged.
33 lights for 5 hours
23 lights for 8 hours } Battery only (when fully charged).
32 lights as long as wanted—Dynamo running and battery floating.

This outfit has 1½ H. P. surplus power that may be used for other purposes while battery is charging.

Specifications for Type "F" Electric Light Plant with 3 H. P. Fairbanks-Morse Type "Z" Oil Engine

Outfit No. 4067S Code word, Smoke

1 900 watts, 30 to 42 volts, multipolar, shunt wound, BALL-BEARING DYNAMO.
16 cells Sealed Glass Jar Storage Battery (120 ampere hours), with Hydrometer Syringe.
1 type "FS" Switchboard.
1 3 H. P. Type "Z" Hopper-cooled Oil Engine with built-in oscillating Magneto, Compression Relief Device and 18″ x 3″ Steel Split Pulley.
The engine may be operated on either kerosene or gasoline.

Outfit No. 4068S Code word, Smoky

Same as above, but without engine. Can be operated from any engine or line shaft.

Type "F" Light and Power Plants

3 H. P. 100 Light Plant

Capacity in Sixteen candle power lamps, consuming 20 watts each

100 lights for 5 hours—Dynamo running and battery fully charged.
42 lights for 5 hours } Battery only (when fully charged).
30 lights for 8 hours }
58 lights as long as wanted—Dynamo running and battery floating.

This outfit has 1¼ H. P. surplus power that may be used for other purposes while battery is charging.

Specifications for Type "F" Electric Light Plant with 3 H. P. Fairbanks-Morse Type "Z" Oil Engine

Outfit No. 4094S **Code word, Wreck**

1 1500 watts, 30 to 42 volts, multipolar, shunt wound, BALL-BEARING DYNAMO.
16 cells Sealed Glass Jar Storage Battery (160 ampere hours), with Hydrometer Syringe.
1 Type "FSA" Switchboard.
1 3 H. P. Type "Z" Hopper-cooled Oil Engine with built-in oscillating Magneto, Compression Relief Device and 18" x 3" Steel Split Pulley.
The engine may be operated on either kerosene or gasoline.

Outfit No. 4095S **Code word, Wrong**

Complete with sealed glass jar storage battery, same as above, but without engine. Can be operated from any engine or line shaft.

6 H. P. 200 Light Plant

Capacity in Sixteen candle power lamps, consuming 20 watts each

200 lights for 5 hours—Dynamo running and battery fully charged.
56 lights for 5 hours } Battery only (when fully charged).
40 lights for 8 hours }
144 lights as long as wanted—Dynamo running and battery floating.

This outfit has 3 H. P. surplus power available for other purposes while battery is charging.

Specifications for Type "F" Electric Light Plant with 6 H. P. Fairbanks-Morse Type "Z" Oil Engine

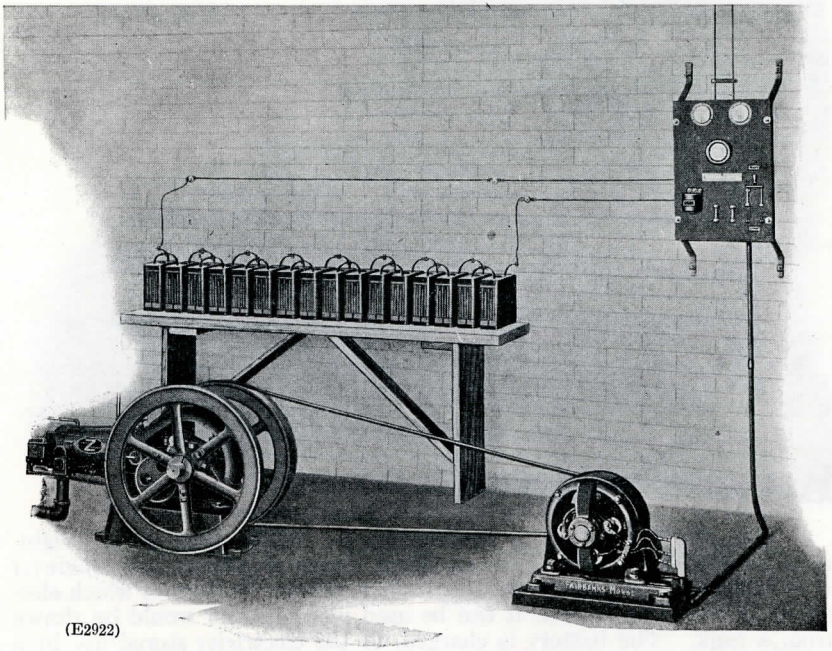
Outfit No. 4098S **Code word, Xysma**

1 3500 watts, 30 to 42 volts, multipolar, shunt wound, BALL-BEARING DYNAMO.
16 cells Sealed Glass Jar Storage Battery (200 ampere hours), with Hydrometer Syringe.
1 Type "FEB" Switchboard.
1 6 H. P. Type "Z" Hopper-cooled Oil Engine with built-in oscillating Magneto, Compression Relief Device and 22" x 4" Steel Split Pulley.
The engine may be operated on either kerosene or gasoline.

Outfit No. 4099S **Code word, Yacht**

Same as above, but without engine. Can be operated from any engine or line shaft.

With Type "Z" Engine Arranged for Tank or Forced Circulation of Cooling Water



(E2922)

Type "F" Lighting Plant with Closed Water Jacket "Z" Engine

Besides the type "F" light plants illustrated in the preceding pages, in which the engine is cooled by water enclosed in a large open hopper surrounding the cylinder, we offer outfits in which the engine cylinder has a closed water jacket. This jacket may be connected either to running water or to a cooling tank, so that the cooling water will circulate continuously while the engine is running. With this style of engine the plant may be run for longer periods without attention, as the replenishing of the cooling water in the hopper is avoided. This plant is especially desirable for continuous service in a closed room where vapor from the open hopper might be objectionable.

This engine, like the open hopper style previously described, is arranged for **self-starting** and draws but lightly from the plant battery. It also has **built-in oscillating magneto, throttling governor,** and **runs on kerosene.** It has excess power which you can use either direct or on a line shaft to operate your water system, cream separator, power washer, etc. Economical power for all farm work can also be obtained from your electric current through the use of electric motors.

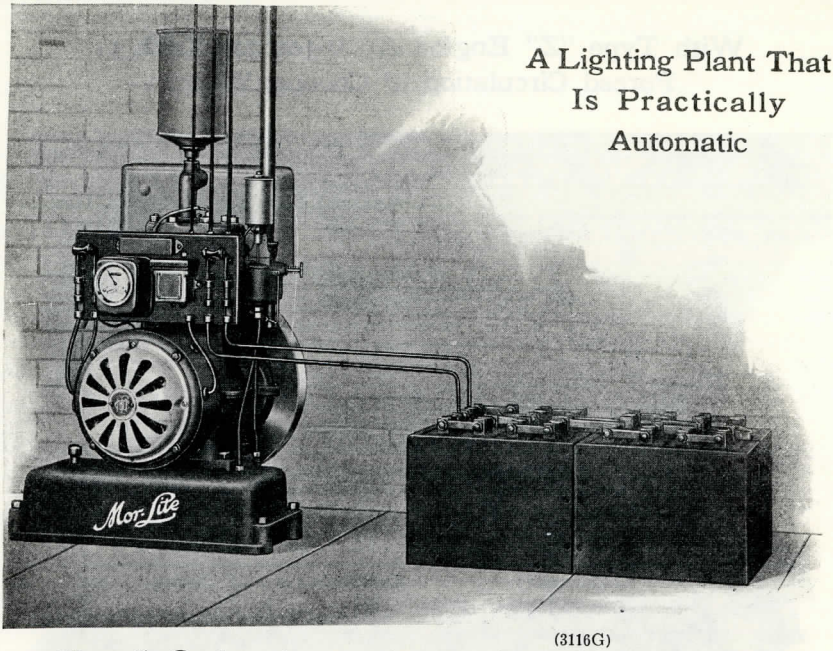
3 H. P. 50 light plant—Outfit No. 5065SB—Code word, Aflat. Same as Outfit 4065SB, except that engine has the closed water jacket, cooling tank and piping. Complete with Built-in Oscillating Magneto, compression relief device and one crowned face flywheel.

3 H. P. 65 light plant—Outfit No. 5067S—Code word, Aery. Same as Outfit 4067S, except that engine has the closed water jacket, cooling tank and piping. Complete with Built-in Oscillating Magneto, compression relief device and one crowned face flywheel.

3 H. P. 100 light plant—Outfit No. 5094S—Code word, Aesop. Same as Outfit 4094S, except that engine has the closed water jacket, cooling tank and piping. Complete with Built-in Oscillating Magneto, compression relief device and one crowned face flywheel.

6 H. P. 200 light plant—Outfit No. 5098S—Code word, Afar. Same as Outfit 4098S, except that engine has the closed water jacket, cooling tank and piping. Complete with Built-in Oscillating Magneto, compression relief device and one crowned face flywheel.

Mor-Lite Electric Plant



(3116G)

The Mor-Lite plant is a semi-automatic outfit that gives bright, clean electric light to the farm or village home—whenever and wherever it is wanted. The lights are run from a storage battery in which electricity is stored up so that it can be used just as water would be drawn from a tank. The battery is charged, or the electricity stored up, by a simple, self-contained plant that **almost runs itself.**

The Mor-Lite plant as shown above is a **Simple, Self-contained Unit,** a combined Engine and Dynamo, taking up little floor space. It does not require a skilled electrician to install it as it is all connected up when shipped. Simply bolt the engine down to the floor or foundation, put the battery on a bench or a stout shelf on the wall, run wires to the lights and to the battery and outfit is ready to run.

There is no Belt—only one Shaft—only two Bearings—no separate Switchboard to connect up.

It is self-oiling—there are **no oil cups to fill or regulate** when the engine starts. Filling one large reservoir with oil will provide sufficient lubrication for weeks of regular operation.

A novel electric governing system regulates the speed of the engine and the voltage of the dynamo. It runs slowly with light load and faster when the load is heavy. There is an electric coil or solenoid which opens up the throttle and speeds up the engine when the voltage is low or closes it and slows down the engine when it is high, thus keeping the voltage just right all the time.

Simply pushing a button starts the engine, the dynamo acting as a motor for this purpose and turning the engine over rapidly until

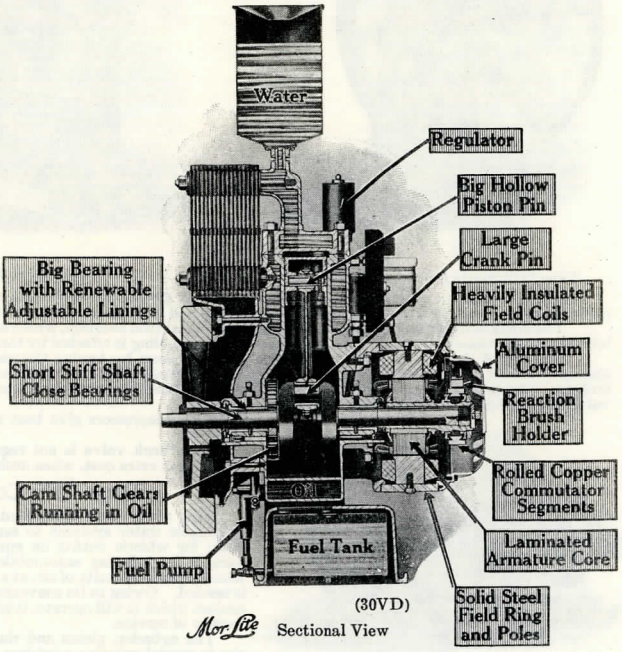
ignition begins, then changing automatically over to a generator and making current to charge the batteries or run lights.

First-class Design and Workmanship

The sectional view below illustrates the principal working parts of the power plant. Every detail has been worked out with the utmost care by our expert engineers. All the wearing parts are made big and strong and easily renewable, and the workmanship is of the highest class. No expense has been spared in the design and construction of this plant that can promote convenience and reliability of operation, and thereby make it a source of comfort and satisfaction to the owner.

The battery is of the enclosed type, consisting of 16 cells sealed in hard rubber jars, and is shipped charged and ready for use.

All the care the battery needs is to be kept charged and a little pure water added from time to time to replace evaporation. All the care the engine needs is to be kept supplied with fuel, lubricating oil and cooling water and the starting button pressed when you want it to run.



(30VD)
Mor-Lite Sectional View

An ampere-hour meter on the control panel always shows the amount of electricity stored in the battery. There is a pointer that moves in one direction as the battery charges and in the opposite direction as it discharges, and when the battery is completely charged it automatically interrupts the ignition circuit and stops the engine. An electric bell is furnished and arranged to ring when the battery needs re-charging continuing until starting button is pressed, thus warning you to protect the battery from injury due to over-discharge.

The battery charging current is automatically regulated on the new **constant voltage system,** which charges the battery in the shortest possible time and with a **tapering charge** that promotes the highest capacity and long life of the battery.

Mor-Lite Plant—Outfit No. 4039—Code Word, Serra

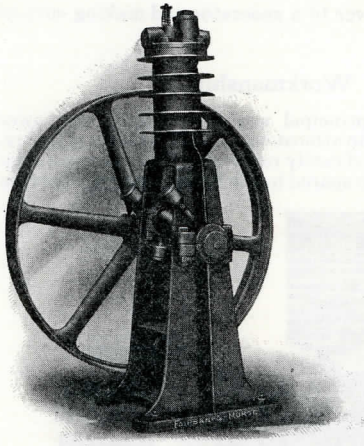
Complete with engine and generator mounted on one base; panel board with meter, starting device and switches; regulator; water tank and radiator; storage battery of 16 cells charged ready for use.

Capacity—Forty 20-watt, 18-candle power Mazda lamps for 6 hours with engine running and batteries fully charged. Battery alone, 20 lamps for 5 hours, 15 lamps for 6 hours on one charge. Plant operates at 30 volts.

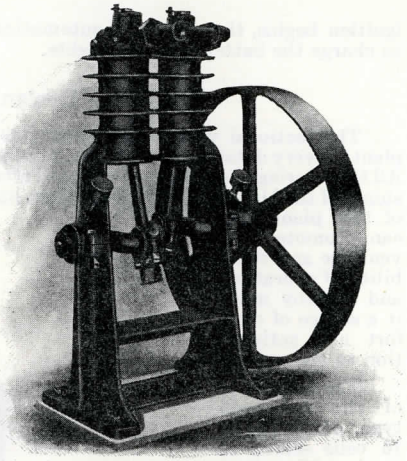
Floor Space—Actual, 2 ft. by 3 ft.; height 43 in. We recommend that a space 5 ft. by 5 ft. be provided.

Fairbanks-Morse Air Compressors

Single-Acting, Air Cooled



(1214M)
Type "C" Single Cylinder Compressor



(1188M)
Type "CC" Double Cylinder Compressor

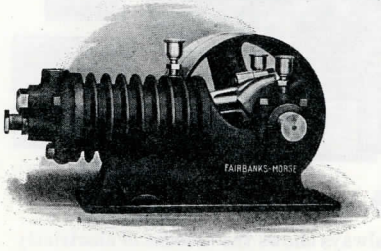
These vertical air cooled compressors are suitable for general intermittent service to work against pressure up to 150 pounds and are very generally used in garages and in connection with water systems, etc.

The crank and pitmans are forged steel and run in babbitted bearings, which are adjustable for wear and are lubricated by means of compression grease cups. Rapid cooling is effected by the thin, wide radiating flanges.

Slippage of air past the piston is reduced to a minimum by having the pistons and cylinder ground to size and polished and the metallic expansion rings, which are not affected by heat, correctly shaped by a grinding process. The intake valve is drop forged, turned and ground to a perfect seat and the cup-shaped discharge valve is of polished steel, insuring very efficient service.

These compressors give best results when operated at 250 R. P. M.

An air check valve is not regularly furnished, but can be supplied, at extra cost, when desired.



(1272M)
Type "F" Compressor

Type "F" Compressor

This compressor is adapted for use in connection with pneumatic water systems to supply the air in the pressure tank; for whistle outfits on small motor boats; in private garages for inflating automobile tires, and in other places where a small quantity of air, at a comparatively high pressure is needed. Owing to its convenient size and the high pressure against which it will operate, it is readily adaptable to a great variety of service.

The cylinder, piston and rings are accurately ground to size in special grinding machines so that maximum efficiency is maintained and all bearings are arranged to compensate for wear. It is equipped with tight and loose pulleys for belt drive.

Specifications Types "F," "C" and "CC" Compressors

Outfit Number	Type	Cylinder: Diameter, Inches	Cylinder: Stroke, Inches	Revolutions per Minute	Piston Displac. Cubic Feet per Minute	§Horse Power Required at Speed Given	Air Pressure, Pounds	Pipe Opening, Inches: Air Inlet	Pipe Opening, Inches: Air Discharge	*Belt Wheel: Diameter, Inches	*Belt Wheel: Face, Inches	Floor Space, Inches	Height, Inches	Approximate Shipping Weight, Pounds	Code Words
1561	*F	1 13/16	2	450	1.34	¼	150	.....	¼	6	1½	11½x8½	6	30	Piper
1521	C	3¼	4½	250	5.4	1½	125	¾	¾	24	3½	24x17	32	183	Nodal
						1½	40	¾	¾	24	3¼	24x22½	32	239	Noddy
1522	CC	3¼	4½	250	10.8	3	125	¾	¾						

*The Type "F" compressor is regularly furnished with tight and loose pulleys. Other Types, "C" and "CC" compressors are regularly furnished with a single belt wheel, but can be furnished with tight and loose pulleys when so ordered, at additional cost.

§Special pulleys will be required Type "Z" engines in some cases to drive these compressors at rated speeds: To drive Type "F" use regular pulley on 1½ H. P. engine.
" " " "C" or "CC" " 12"x 4" " on 1½ H. P. "
" " " "CC" " 14"x 4½" " on 3 H. P. "

For larger air compressors send for special bulletin.

These new models have underneath drive: The mechanism is firmly supported by the rigid steel table —not by the tub—so that any change in the tub cannot affect the operation of the washer. The joint in the dolly shaft is **above** the water line and so cannot leak. The mechanism being underneath, the clean clothes cannot come into contact with oil or greasy parts. The Fairday Washers are up-to-date, tried, dependable machines — efficient and durable—that do big washings easily, quickly and at low cost.

Fairday TWIN ELECTRIC OR POWER WASHER
Electric Model, 1720; Belt Drive Model, 1723

(831GC)

Fairday **Twin Washer, Models 1720 and 1723:** This machine is **two washers in one,** but it gives **greater capacity than two single washers.** The twin washers are mounted on a steel bench, which has an extension to accommodate two rinse water tubs. The mechanism is driven **from below** as explained above.

With the **swinging power wringer doing all the lifting** the clothes go in a continuous cleansing process from one tub to the other. From the first suds in tub No. 1, the clothes go **while still warm** directly into the hot suds of tub No. 2. With a single washer the clothes would be wrung into a basket, to lie and cool off while the balance of the wash was being run through the first suds. Then when it came time to run them through the second hot suds, the cold wet clothes would materially cool off the suds and thus lessen the cleansing effect.

When the first lot of clothes is put in the suds of Washer No. 2, the second lot of soiled clothes is put in the warm suds of tub No. 1, and its washing mechanism started.

When the first wash, now in tub No. 2, is ready to take out, the operator swings the power wringer around and **lets it do all the lifting** into the first rinse water in tub No. 3, and from there into second rinse water or bluing water of tub No. 4.

Note that either washer may be used independently of the other, or the swinging power wringer may be used in any position, whether the washers are running or not. The power is controlled by separate levers with all working parts **on the bottom of the tubs,** out of the way.

Model 1720. Twin Washer Electric Drive. Shipping weight, 320 lbs. Code word, **Suage.**
Model 1723. Twin Washer Belt Drive. Shipping weight, 280 lbs. Code word, **Suave.**

Fairday Power and Electric Washers

(830GC)

Fairday SINGLE TUB EXTENDED FRAME WASHER
Electric Model, 1719; Belt Drive Model, 1722

The Fairday offers the best solution of the washing problem—does perfect work and saves time—labor—money. **No lifting** or shifting of heavy tubs, tugging at an obstinate wringer, bending, cramped positions, red, raw hands, or doctor's bills.

Fairday **Single Tub Extended Frame Washer, Models 1719 and 1722:** Wherever washings are not so large or the space in the laundry is limited, the needs will be well filled with this single tub model. It is mounted on a steel frame, which extends to accommodate two rinse tubs and a clothes basket, and has the same size tub as all other Fairday washers—10% larger than the regular standard. The swinging power wringer operates in any position within its radius and **lifts the clothes from the washer to the rinse tub, and from the rinse tub to the basket,** while the housewife superintends the job. The mechanism is all **underneath the tub,** as explained on page 45, the power for the washer and wringer being controlled by separate levers readily accessible.

Model 1719. Single Tub, Extended Frame, Electric Drive. Shipping weight, 270 lbs. Code word, **Styx**
Model 1722. Single Tub, Extended Frame, Belt Drive. Shipping weight, 230 lbs. Code word, **Suade**

Whether washing is done by housewife or maid, the Fairday soon pays for itself in the many savings it effects. The woman with a Fairday can have her clothes on the line, and her ironing under way, while her neighbors are still struggling along washing by the old, inefficient methods. Let the POWER do the work! The cost? A few pennies for the average wash.

Fairday **Single Tub Washer, Models 1718 and 1721:** This washer is similar to the single-tub model described above except that it does not have the extended frame. It occupies small space and is light enough to be easily moved. The harmless Fairday way of washing does away with the wear of rubbing on clothes, which will be cleaned thoroughly by simply forcing the water through the fabrics. You should tell your customers to take advantage of this economy.

(829GC)

Fairday SINGLE TUB WASHER
Models 1718 and 1721

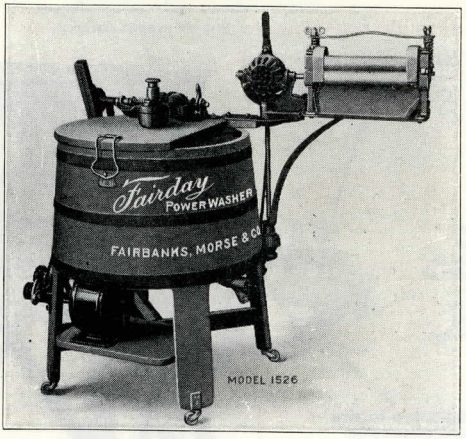
Model 1718. Single Tub Washer, Electric Drive. Shipping weight, 240 lbs. Code word, **Styme.**
Model 1721. Single Tub Washer, Belt Drive. Shipping weight, 200 lbs. Code word, **Stylo.**

Fairday Stave Leg, Models 1526 and 1512: This is a popular priced washer requiring small floor space. The same high standards of construction are maintained in this Fairday model, but it differs from the others in that the driving mechanism is set on top of the tub. The **Swinging Power Wringer** can be used in three positions, and is instantly controlled by a hand lever conveniently located. It has a strong malleable iron frame, frictionless bearings and reversible drain board.

The legs are braced with wooden braces and metal tie rods, giving the utmost stability and durability. This washer is made a convenient height, so that the operator does not have to stoop when using.

Model 1526. Stave Leg, Electric Drive. Shipping weight, 215 lbs. Code word, **Sculp.**

Model 1512. Stave Leg, Belt Drive. Shipping weight, 175 lbs. Code word, **Scurf.**



Fairday STAVE LEG SINGLE TUB WASHER
Electric Model, 1526; Belt Drive, Model 1512

Note These Fairday Efficiency Points

Simplicity of Mechanism: Gears are encased and run in oil—always firmly held in position—no leaking—no oil on clean clothes. Frequent oiling unnecessary. The drive is **from below,** all mechanism being attached to the metal frame, **underneath the tub.** The pulley is on the side opposite the operator—the control levers all handy. There is a separate lever for starting and stopping each tub and wringer. The lid is corrugated, so it may be used as a washboard if desired. It may be easily lifted. There are no bolts through the tub—the mechanism cannot be forced out of line. A drain faucet is used on all models.

Swinging Power Wringer: The wringer is of wood frame with maple bearings and high grade rubber rolls. It is held firmly in desired position by a positive gripping device. It is so placed as to always be most convenient for the operator. The lever for starting, stopping and reversing the wringer is also conveniently placed. A patented quick-releasing device keeps wringer under instant control at all times.

Frame: The frame of the table type machine is made of 1 x 1 x $\frac{1}{8}$-inch angle iron, well braced to give strength without unnecessary weight. The frame is 16 inches high and the total height to the top of the tub is 31 inches. Casters are furnished with the electric models only.

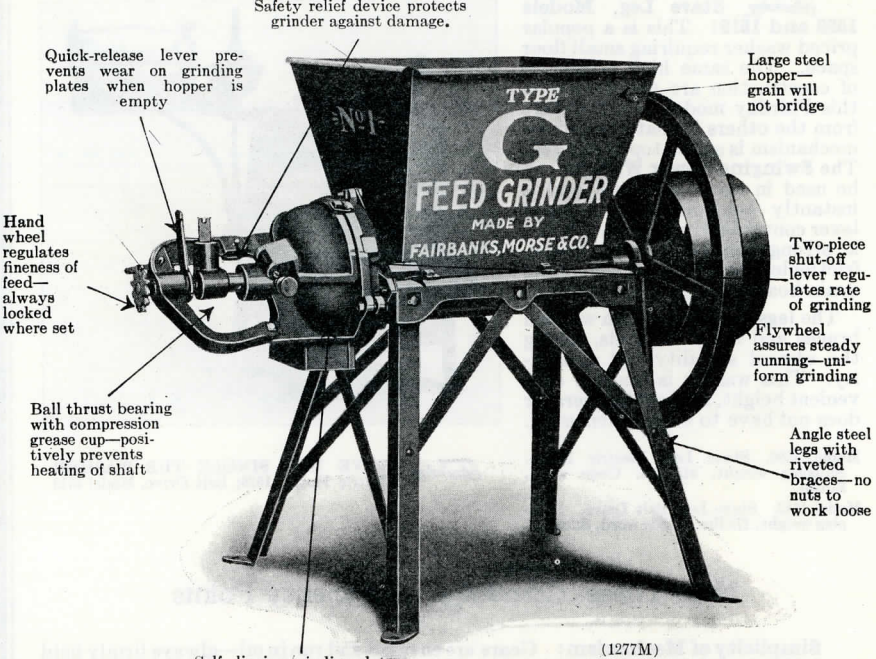
Tub: The tub is made of durable Florida cypress. The staves are three inches wide, making a strong, substantial tub. The under side of the lid to the tub is corrugated, for use as a washboard if desired. The tub is 10 per cent larger than the standard size, giving greater capacity.

Motors: Motors of $\frac{1}{4}$ H. P. are used with all electric models, except No. 1526 Stave Leg, having a $\frac{1}{6}$ H. P. motor. The motor is connected by belt and placed on movable platform to keep the belt always tight. If desired, a rub board dolly can be furnished at an extra charge. Cord and plug are furnished for attaching to electric light socket.

Pulleys: 12-inch pulley regularly furnished on models 1721, 1722, 1723. Speed of washer 250 r. p. m.; 10-inch on model 1512, speed 175 r. p. m. 8, 10, 14-inch pulleys furnished on special order. Belt face 2 inches.

Type "G" Feed Grinders

Note These Many Valuable Features



(1277M)
No. 1 Type "G" Feed Grinder

The No. 1 and No. 2 Type "G" Feed Grinders are, of the same design and are adapted for the grinding of small grain, such as oats, barley, wheat or shelled corn and corn on the cob, or corn on the cob with mixed grain. Shelled corn, oats, wheat, barley or other small grain, separate or mixed, is ground fine in one operation, leaving the product evenly mixed. They will crush ear corn and grind it fine in one operation.

These mills are furnished with **fine** plates for grinding dry grain or shelled corn very fine, and with **medium** plates for grinding new or damp grain and ear corn medium fine. For grinding corn on the cob very coarse, a set of **coarse** plates can be furnished as an extra, or in place of one of the two sets regularly furnished.

The fineness of the **grinding is regulated by a hand wheel** carried by a short lever, which also carries a **ball thrust bearing** and is attached to the end plate by a wood breaking pin at one end and by a bolt at the other. In case anything gets in with the grain which cannot be crushed, the soft or brittle wood pin breaks, affording instant relief, thus avoiding damage to the grinder. This pin should be of soft wood and is easily replaced. By shifting the **quick-release lever** and without changing the screw adjustment the grinder can run empty without wearing the plates.

The revolving plate holder is provided with a cleaner which prevents husks from clogging the discharge opening around the plates.

To change or replace the grinding plates, simply loosen two bolts on the frame head, take off the elevator sprocket wheel and make the change. The **feed is regulated** by moving the two-piece **shut-off slides**, which open or close the throat. Thumb nuts are provided for fastening these slides in the desired position.

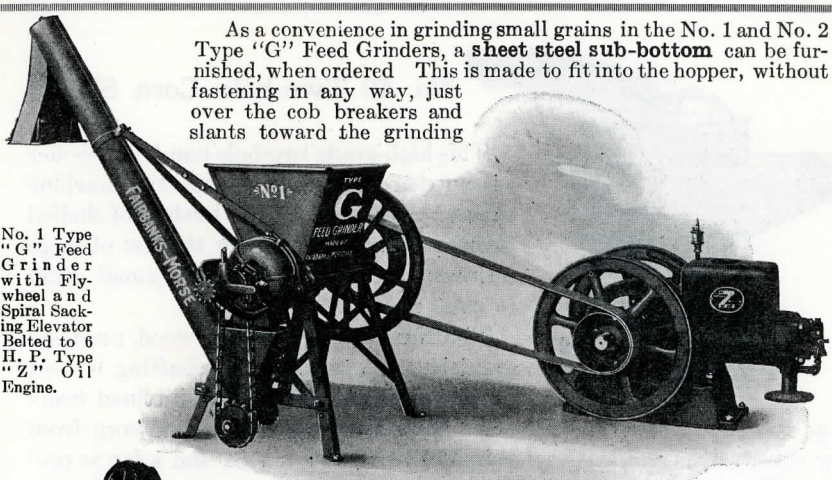
The shaft is fitted with **cast-iron cob breakers**, made in sections.

The **No. 0 Feed Grinder** is adapted for grinding small grain, such as oats, barley, wheat, shelled corn, etc., and can be driven by a small Type "Z" engine.

It is similar in many respects to the No. 1 and 2 Type "G" Feed Grinders, except that it has smaller grinding plates and will not grind ear corn.

Aside from this, it has all of the unique and valuable features of the larger grinders, including regulating hand wheel, ball thrust bearing, quick release lever, wood breaking pin, shut-off slide, hinged cast-iron cover over grinding chamber, and worm feed.

Fairbanks-Morse Feed Grinders



No. 1 Type "G" Feed Grinder with Flywheel and Spiral Sacking Elevator Belted to 6 H. P. Type "Z" Oil Engine.

(3243G)

As a convenience in grinding small grains in the No. 1 and No. 2 Type "G" Feed Grinders, a **sheet steel sub-bottom** can be furnished, when ordered This is made to fit into the hopper, without fastening in any way, just over the cob breakers and slants toward the grinding plates, thus feeding the grain directly to the grinding plates. By lifting out the sub-bottom the grinder is ready to grind ear corn. This sub-bottom is not a necessity when grinding small grain, but is especially beneficial in keeping grain from being thrown out by the cob breakers, when the hopper is almost empty.

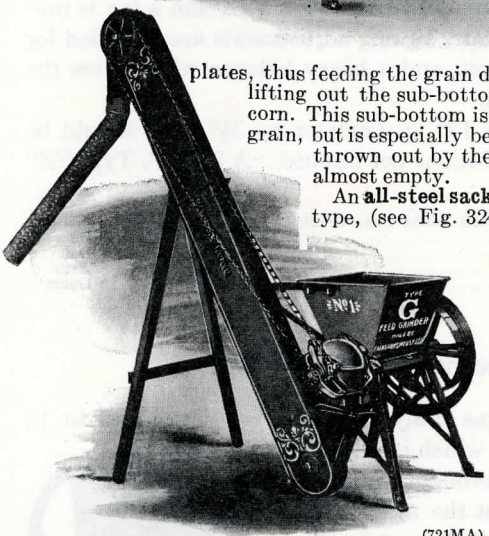
An **all-steel sacking elevator** of the spiral conveyor type, (see Fig. 3243G), can be furnished when so ordered. The discharge opening is just the proper height to take on a 2½-bushel bag and fill it completely.

A **wagon box elevator** (Fig. 721MA) of the wood frame type with link chain conveyor can be furnished at extra cost, in 8, 10, 12 or 14 foot lengths.

A **swinging spout,** shown in Fig. 721MA, is furnished only when ordered at extra cost.

A **flywheel** is furnished as part of the regular equipment of the Type "G" Feed Grinder. Weight 34 pounds for No. 0 Grinder and 52 pounds for No. 1 or No. 2 Grinders.

All wearing parts of Fairbanks-Morse Feed Grinders are renewable and can be replaced at small cost.



No. 1 Type "G" Feed Grinder, with Flywheel and Wagon Box Elevator with Swing Spout

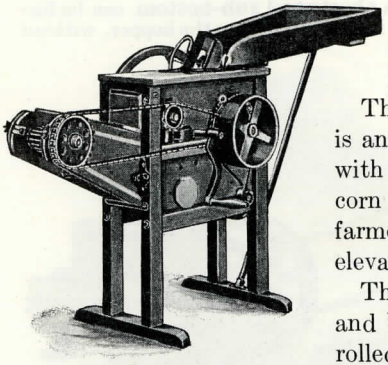
(721MA)

Specifications, No. 0, No. 1 and 2 Type "G" Feed Grinders

Grinder Numbers	H. P. Required	Pulleys Required on Type "Z" Engines	†Size Belt Pulley on the Grinder, Inches	Grinder R. P. M.	Capacity, Bushels per Hour	Size Grinding Plates, Inches	Floor Space, Inches	Height to Top of Hopper, Inches	Distance, Spout from Floor, Inches	Distance, Sacking Elevator Spout from Floor, Inches	Diam. of Flywheel, Inches	Approx. Shipping Weight, Grinder only, with Pulley, Lbs.	Approx. Shipping Weight, Sacking Elevator only, Lbs.	*Code Words, Without Elevator,	*Code Words, With Spiral Sacking Elevator.
0	1½	10x 4	6x4	800	2 to 7	6	24x34	35	13	36	16	164	75	Galop	Galva
0	3	14x 4	6x4	1000	8 to 15										
1	3	10x 4	16x6	290	8 to 15	8	24x36	35	12	36	23	222	75	Gadus	Galba
1	6	12x 6	8x6	600	20 to 30										
2	6	6x 6	12x6	200	20 to 30	10	28x42	37	12	36	23	312	75	Gaily	Galus
2	10	16x10	12x6	460	40 to 50										

†No. 1 and No. 2 Type "G" Feed Grinders are regularly furnished with 12″ x 6″ pulley, but pulleys 6″, 8″, 10″, 14″ or 16″ diameter can be furnished when ordered. No. 0 is regularly furnished with 6″ x 4″ pulley, but pulleys 7″ or 8″ diameter can be furnished when ordered. *Code words include flywheel but not engine.

Hand-Feed Corn Shellers



No. 40 Two-hole Corn Sheller

This high-grade two-hole hand feed sheller is an extra strong and substantial machine with a capacity of 25 to 35 bushels of shelled corn per hour, adapted for the use of large farmers, stock feeders and for small grain elevator service.

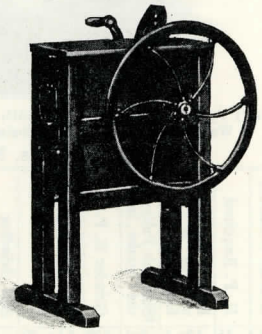
The frame is made of hard wood, mortised and bolted together. The shafting is cold rolled steel and runs in babbitt lined bearings. A cob rake with wire chain links separates the shelled corn from the cobs, which are delivered about 18″ from the sheller, and a fan is provided for cleaning the shelled corn. Spring adjustments are provided for shelling large or small ears of corn and a heavy balance wheel gives the machine an even, steady motion.

The driving pulley, which is 12″ in diameter by $3\frac{1}{2}$″ face, should be speeded at from 300 to 325 revolutions per minute. A 3 H. P. Type "Z" Engine should be used.

	Weight, lbs.	Code Words
No. 40, Two-hole Sheller, with Cob Rake, Feed Table, Fan, Crank and 12x3½-inch Pulley	285	Dante
Sacking Elevator, extra	75	Daub
Wagon Box Elevator, extra	120	Dauber
Cob Stacker, extra	60	Dauphin

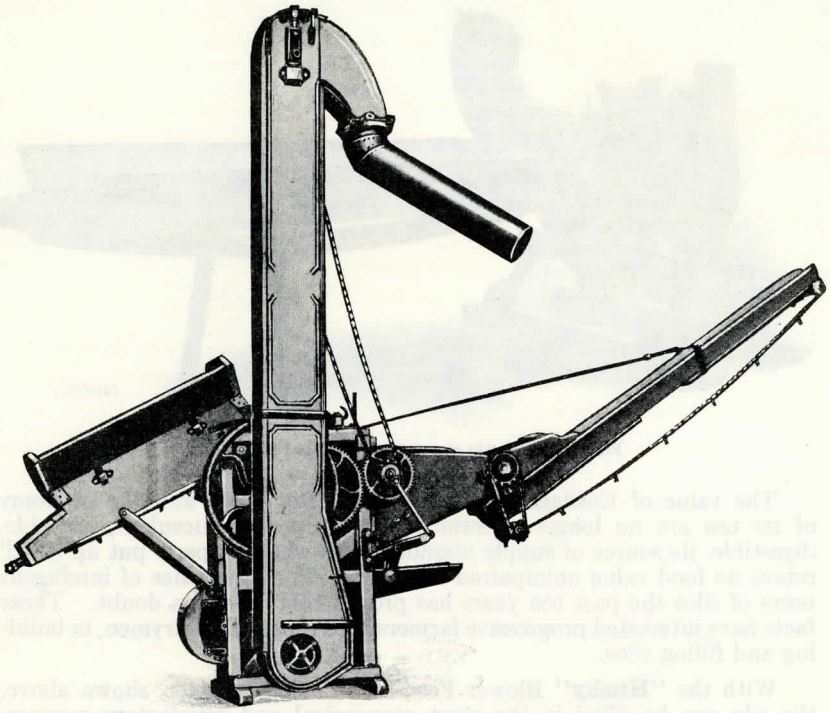
No. 20 One-hole Corn Sheller

This one-hole hand sheller runs easily and has a capacity of 12 to 15 bushels of shelled corn per hour, which it delivers at one end of the machine, thoroughly dusted, while the cobs are thrown out at the other end. It will shell any size ears from the largest to the smallest; even pop-corn can be shelled clean from the cob.



The frame is made of hard wood, mortised and thoroughly bolted, so it will last for years and give excellent service. It is designed to be operated by hand. A good heavy balance wheel makes it easy to turn. An 8-inch pulley clamped to the balance wheel for applying power can be furnished at additional cost. A $1\frac{1}{2}$ H. P. Type "Z" Engine would run it to full capacity.

No. 20 Sheller is furnished complete with crank, balance wheel, feed table and fan; shipping weight, 140 pounds. Code word, Plush.



No. 60 Self-Feed Two-Hole Corn Sheller

Showing Wagon Box Elevator and Cob Stacker attached

This is a rigid, durable two-hole, self-feed sheller, having a capacity of from 60 to 75 bushels of dry corn per hour. It is just the sheller for the farmer who has a 6 H. P. Type "Z" engine.

To withstand the wear and strain, the side panels are lined with sheet steel and mounted in an extra heavy hard wood frame. The shafts are generously large and revolve in babbitted bearings, causing the sheller to run smoothly and easily.

The strong, substantial self feed is controlled by a clutch lever at side of sheller, which can be thrown in or out of gear while machine is in motion. The feed chains have a spring adjustment at lower end. Adjustable springs permit shelling large or small ears.

The cob rake is built into the sheller and lined with sheet steel to take the wear. Unusually large fan capacity and shaker screen cleans the corn thoroughly. The sheller is regularly equipped with fan, self feed table, cleaning device, cob rake and 6″ x 6″ pulley, which should run about 725 R. P. M. Weight, 550 lbs. Code word, Plume.

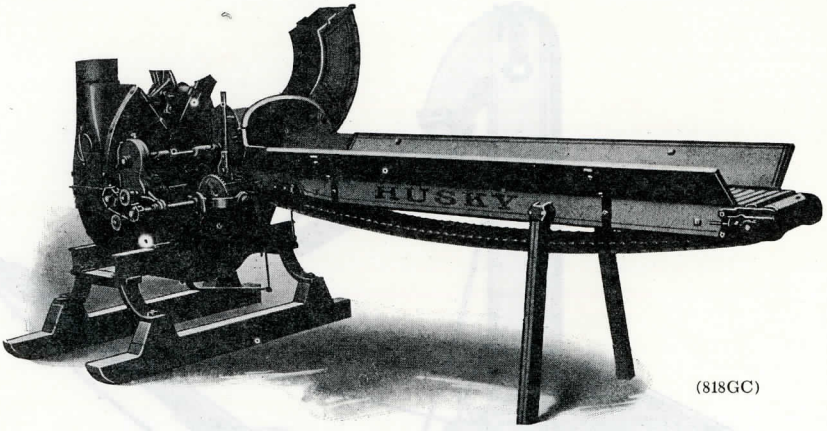
We can furnish the following attachments:

7 ft. cob stacker, weight 56 pounds, code word, Plump.

9½ ft. wagon box elevator, weight 195 pounds, code word, Pluff.

5 ft. sacking elevator, weight 155 pounds, code word, Plica.

"HUSKY" Blower Feed and Ensilage Cutter



(818GC)

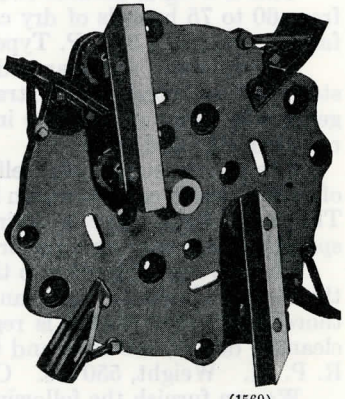
Front View of Outfit mounted on skids, showing case open

The value of Ensilage as a winter feed for stock, and the economy of its use are no longer questioned. It is cheap, succulent, platable, digestible, its source of supply abundant and when properly put up it will retain its food value unimpaired for years. The experience of intelligent users of silos the past ten years has proven this beyond a doubt. These facts have interested progressive farmers, and especially dairymen, in building and filling silos.

With the "**Husky**" Blower Feed and Ensilage Cutter, shown above, the silo can be filled in the most economical and satisfactory manner. This outfit is the result of over thirty years experience with hand and power cutters and combines every up-to-date advantage that can be desired or obtained for successfully preparing ensilage and feeding it into the silo.

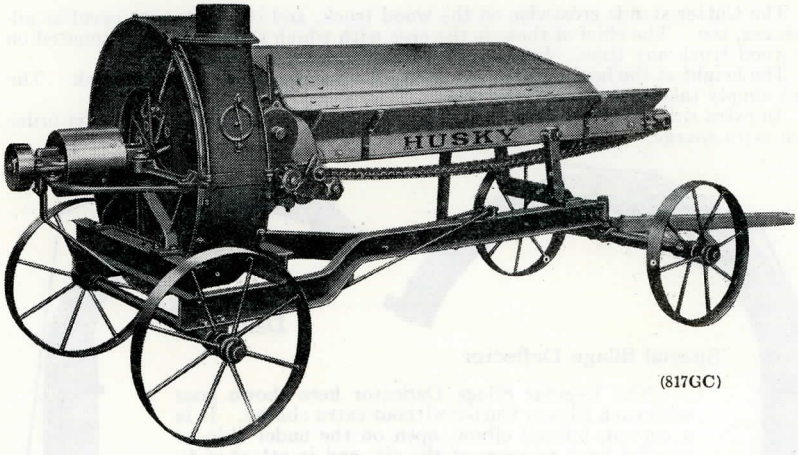
The "**Husky**" Blower Cutter is so compact, so simple in contruction and so free from machinery and complicated parts that its merits are recognized on sight. Excepting the ground sill, it is made entirely of metal. It consists simply of a heavy iron disc or balance wheel to which are attached the knives and fan blades, and these are enclosed in a circular iron drum or case. These with the feed rollers and main shaft on which the balance wheel revolves, constitute practically the whole machine.

Particular attention is called to the I-beam base, which adds special strength and rigidity to the frame.



(1569)
Disc with Knives and Fan Blades

The manner of attaching the knives to the balance wheel calls for special mention. They do not shear, as in other similar cutters, from the



(817GC)

Outfit mounted on Steel Truck

inner end towards the outer end of the shear bar. On the contrary, the knives are so set that they first meet the shear bar at its **outer end,** when the momentum is the greatest and where the work is hardest, and shear **towards the inner end,** as the momentum diminishes and the work decreases. The importance of this construction in the saving of power cannot be overestimated.

The knives are adjusted accurately and in the simplest and easiest manner possible, by a special patent device of our own.

In addition to the knives, we furnish Splitters, when desired, so the material may be shredded as well as cut. They are extra, but are sometimes wanted when it is intended to mix the material with mill feed.

Every machine is provided with a Self-feed Table of suitable length and ample capacity. The action of the chain apron is controlled by a lever within easy reach of the operator, by means of which the feed can be instantly advanced, reversed or stopped, at will.

An Inside Distributor is such an important part of a silo outfit that its use has become almost universal. Its advantages outweigh its cost. By means of it the fine and coarse parts of the material are properly mixed, and the man inside the silo works in comfort. Our Distributor is made of heavy galvanized sheet steel and the sections are wire-bound at each end. In contruction it is almost as flexible as a rubber tube. May be furnished upon order at an additional price.

The **"Husky"** Blower Cutters are mounted when so wanted, upon either one of the two styles of truck, wood or steel. The steel truck is shown above. The machine stands lengthwise on it so that when work is completed at a given place, the machine is ready to be moved. All that is necessary is to put the pipe in the feed table and drive off. Further, the pull of the belt is **across the truck,** and not in the direction it moves.

"HUSKY" Blower Feed and Ensilage Cutter

The Cutter stands crosswise on the wood truck, and it has its own peculiar advantages, too. The chief of these is the ease with which the machine is mounted on the wood truck any time. It also takes much less room when stored.

The height of the feed table is not changed when mounted on either truck. The truck simply takes the place of the base.

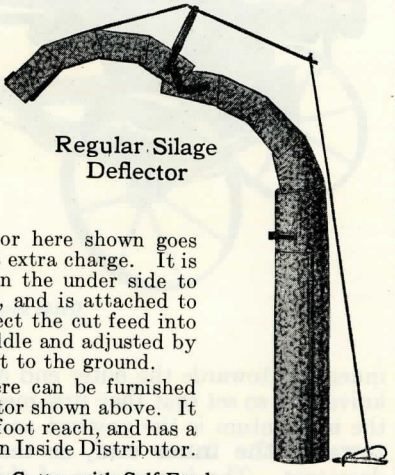
An extra side table and knife grinding attachment may be furnished upon order at an extra charge.

(1567)

Special Silage Deflector

The Regular Silage Deflector here shown goes with each Blower Cutter without extra charge. It is a curved, jointed elbow, open on the under side to prevent back pressure of the air, and is attached to the upper end of the pipe to direct the cut feed into the silo. It is hinged at the middle and adjusted by means of a rope extending from it to the ground.

Instead of the Regular Silage Deflector, there can be furnished at an extra charge the Special Silage Deflector shown above. It is a heavy, strongly braced deflector, with a 6 foot reach, and has a hook at the delivery end from which to suspend an Inside Distributor.



Regular Silage Deflector

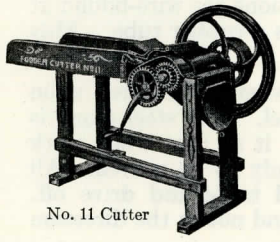
(1568)

"Husky" Blower Feed and Ensilage Cutter with Self-Feed Table and Silage Deflector

Outfit No.		Code Word	Throat (Inches)	Pipe (Inches)	Length of Cut (Inches)	Speed R.P.M.	Capacity Tons Per Hour	H.P.	Diam., Pulley (Ins.)	Approx. Shipping Weight (Pounds)
4079	On Skids	Utter	9	6	½, ¾, 1, 1¼, 2½	900–1000	4 to 6	3 to 5	8	935
4080	On Wood Truck	Uvula								1327
4081	On Steel Truck	Vague								1165
4082	On Skids	Valid	11	7	½, ¾, 1, 1¼, 1½	800–900	6 to 8	4 to 7	9	1280
4083	On Wood Truck	Valor								1670
4084	On Steel Truck	Valve								1465
4085	On Skids	Varix	13	7½	½, ¾, 1, 1¼, 1½	650–850	8 to 12	7 to 10	10	1537
4086	On Wood Truck	Vault								1985
4087	On Steel Truck	Vedro								1850
4088	On Skids	Venal	15	8	½, ¾, 1, 1¼, 1½	600–800	12 to 15	8 to 12	11	2400
4089	On Wood Truck	Venom								2860
4090	On Steel Truck	Venue								2750

Note.—Outfits above are fitted with two knives. Four knives and shredders furnished extra if desired. Can cut ¼-inch lengths with four knives.

Use Bulletin H213 for consumers



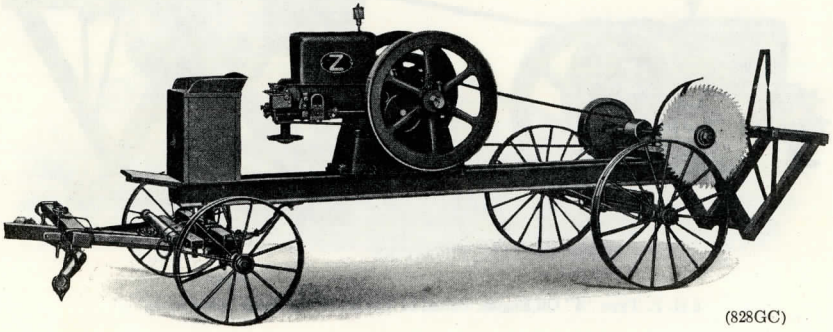
No. 11 Cutter

No. 11 Fodder Cutter

The No. 11 Fodder Cutter can be run by hand, but a 1½ or 3 H. P. Type "Z" engine is recommended. It has two heavy 11″ spiral knives with a down cut, and will cut the fodder into ¼″, ½″, ¾″ or 1″ lengths. It has a heavy balance wheel, hand crank and 10″ x 4″ pulley. Speed, 300 to 400 r. p. m. The spiral springs on each side of the rollers prevent binding or clogging, and allow the fodder to be fed close to either side without strain on the gears or rollers. It also has a safety device to prevent serious injury to the machine, should any substance be fed which the knives cannot cut. It is shipped knocked down. Weight, 262 pounds. Code word, Darken.

Use Bulletin H125 for consumers

Note the powerful Type "Z" Oil Engine; the All-steel Rigid Construction; and the Wide Tread and the Low Center of Gravity for Stability.



(828GC)

6 H.P. Saw Rig

Here is a substantial Portable Saw Rig that has power enough to cut hard or soft wood up to 10 inches in diameter, at the rate of 3½ cords or more per hour, depending on conditions, and should keep four men busy

The Engine is the well-known Type "Z," which operates on kerosene as well as gasoline. The throttling governor insures the steady pull required for sawing wood.

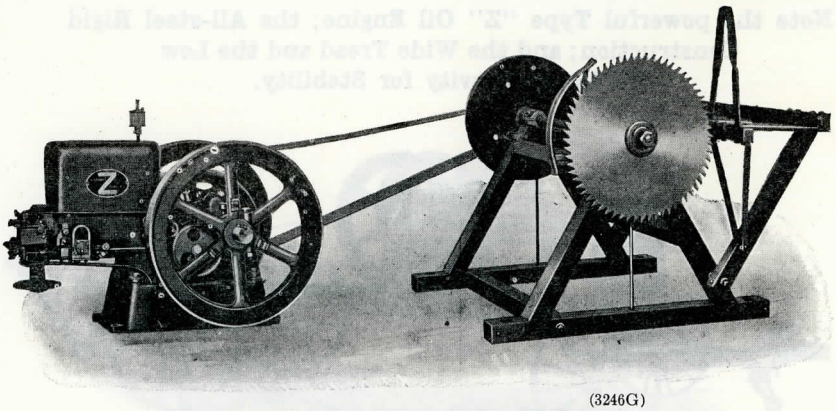
The Saw Frame is made of seasoned wood, well braced. It has a tilting table placed at proper height for rapid work. The large balance wheel, with thick, heavy rim, carries the saw through knots and heavy wood. The belt pulley on the saw mandrel is placed inside of the balance wheel. A suitable rubber belt, with proper size engine pulley, is included with the outfit. The saw is placed at the left as one faces the arbor, and it is provided with a steel guard for the safety of the operator.

The All-Steel Truck is made specially for this service, securely riveted and bolted—rigid and strong, with wide tire wheels for country roads. The tongue, neckyoke, double and single trees and bolt, seat and footrest are all furnished as part of the regular equipment with this outfit.

The Complete Outfit is shipped knocked down for convenience in handling and to save freight charges.

Outfit Number	Horse Power	Engine Speed, R. P. M.	Special Pulley on Type "Z" Engine Diam. and Face, Inches	Saw Arbor Pulley, Diam. and Face, Inches	Saw Diameter Recommended, Inches	Balance Wheel Weight, Lbs.	Size Truck Wheels, Inches		Tread, Inches	Approx. Shipping Weight, Lbs.	Code Word
							Front	Rear			
4100	6	400	18x6	5x6	28	60	24	32	54	1750	Clung

Type "Z" Engines with Saw Frames



(3246G)

6 H. P. Type "Z" Oil Engine, Belted to No. 23 Tilting Table Saw Frame

The 1½ horse-power outfit is suitable for farmers when only one or two men are expected to keep busy. This should saw soft wood 6 inches in diameter at approximately 1 to 1½ cords per hour. Will handle hard wood of small size, but not as much per hour.

The 3 horse-power outfit is large enough to do some regular job work. Will saw soft wood up to 8 inches in diameter at from 2 to 2½ cords per hour and up, hard wood up to 6 inches in diameter, depending on conditions, and should keep three men busy.

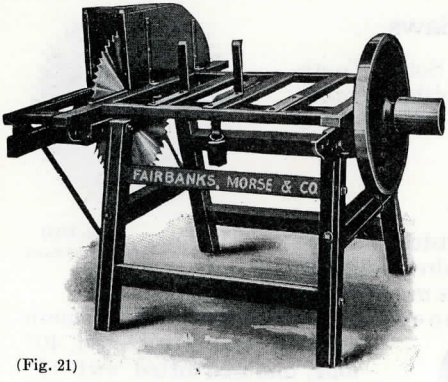
The 6 horse-power outfit should handle hard or soft wood up to 10 inches in diameter at the rate of 3½ cords per hour and up, depending on conditions, and should keep four men busy.

These ratings are based on cutting full cords of wood—4 feet x 4 feet x 8 feet—making two cuts per stick—or, in other words, cutting the 4-foot wood into 16-inch lengths.

The outfits listed below consist of a Tilting Table Saw Frame, Figure 23, described on page 57, and engines shown on pages 3, 4 and 5. The engines are equipped with a large diameter pulley to drive the saw at proper speed. Belting is not included. 4-inch, 4-ply, rubber belting—10-foot centers—22 feet of belt is recommended (belting 30 to 40 feet long will give even better results). Belting can be furnished at market price when specially ordered. This saw frame can be fitted with a pole extension, if specially ordered, at an extra cost—weight, 80 pounds extra.

Sizes and Specifications Type "Z" Engines and No. 23 Saw Frames

Outfit Numbers Engine and Saw Frame	Horse Power	Engine Speed R. P. M.	Special Pulley on Type "Z" Engine Diam. and Face Inches	Saw Arbor Pulley, Diam. and Face, Inches	Saw Diameter Recommended, Inches	Approximate Shipping Weight, Pounds.	Code Words, Engine and Saw Frame
4046	1½	500	16x4	5x6	20	666	Sissy
4045	3	450	16x6	5x6	26	836	Sizer
4044	6	400	18x6	5x6	28	1210	Skate



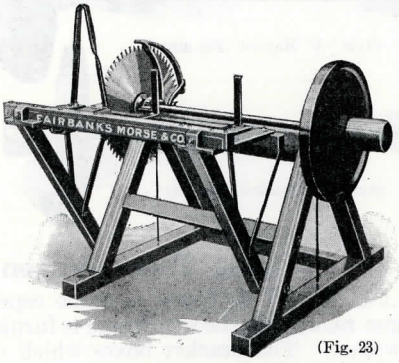
(Fig. 21)

Sliding Table Saw Frame (Left Hand)

These saw frames are made of hardwood, well braced and painted. As will be seen from the following specifications, they are high grade, durable machines, suitable for use with Type "Z" oil or gasoline engines.

The mandrels are $1\frac{1}{2}$" cold rolled steel, 53" long, grooved at the bearings to prevent end play. The two bearing boxes are babbitted and are connected by a heavy iron bar, which keeps the mandrel in perfect alignment.

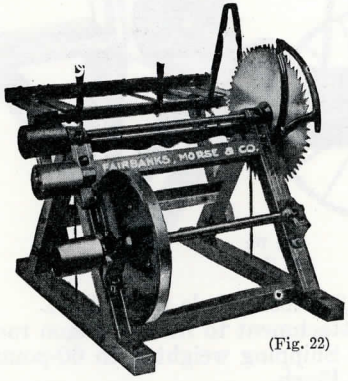
These frames will accommodate saws from 20" to 30" in diameter with $1\frac{3}{8}$" arbor hole. The arbor flanges are 5" in diameter. Left hand cut is regularly furnished, but right hand cut can be furnished on special order. The driving pulley on each is 5" diameter with 6" crown face. The balance wheel weighs 95 pounds. All saw frames are shipped "knocked down," with full instructions how to set up and operate. Saws are not regularly included with the frames.



(Fig. 23)

Tilting Table Saw Frame (Left Hand)

Fig. 21 Sliding Table Saw Frame.....Weight 360 lbs.....Code Word—Dangling
Fig. 23 Tilting Table Saw Frame.....Weight 310 lbs.....Code Word—Daniel



(Fig. 22)

Pole Saw Frame (Left Hand)

Pole Saw Frame

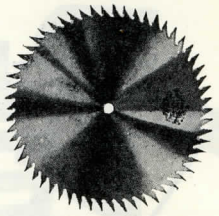
This frame is built especially for sawing long poles or fence rails, although it saws cord wood equally as well. The balance wheel is hung under the frame out of the way of the table. Both shafts are $1\frac{1}{2}$ inches in diameter, 53" long, extending entirely across the machine. Will take saws 20" to 30" diameter; arbor $1\frac{3}{8}$"; 95 lb. balance wheel; three 5"x6" pulleys. Left hand cut always furnished unless otherwise ordered.

Fig. 22 Weight 400 lbs.....Code Word—Dangle

Special.—Balance wheels, different from ones regularly furnished, can be furnished to order direct from factory; 60 lb., 75 lb., 95 lb. or 125 lb. balance wheels for any of the above frames, or for saw mandrels and wagon rack attachments shown on page 58.

Solid Tooth Circular Saws

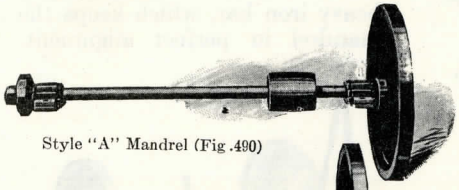
20″, 26″ and 28″ diameter Solid Tooth Circular Saws are regularly furnished; other sizes can be supplied if desired; all standard thickness and $1\frac{3}{8}$″ hole.



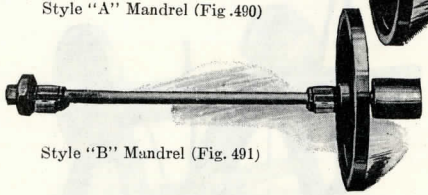
(Fig. 1311)
Solid Tooth Circular Saws

Saw Mandrels

In addition to the frames listed on the previous page, we furnish a saw mandrel, designed to be bolted on rear end of the frame mounted on trucks and used in connection with an engine. This outfit consists of main shaft $1\frac{1}{2}$″ cold rolled steel, 49″ long, one end fitted with $1\frac{3}{8}$″ arbor with 5″ flanges, the other end fitted with a pulley 5″ in diameter and 6″ crown face, and a 95-pound balance wheel. Babbitted boxes are furnished, suitable for bolting to timbers. Furnished in two styles, as shown in cuts. Both the same price. Always specify whether Style "A" or "B" is wanted.



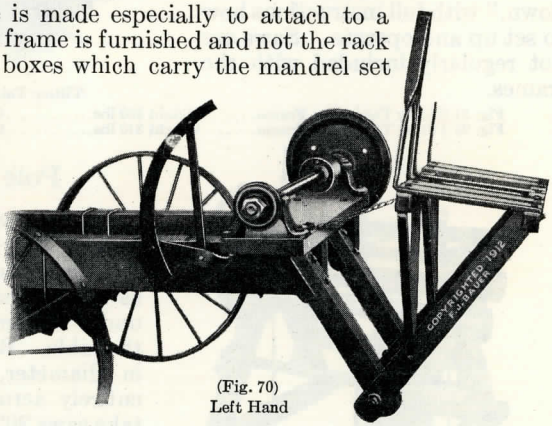
Style "A" Mandrel (Fig .490)



Style "B" Mandrel (Fig. 491)

Tilting Table Wagon Rack Attachment

Fig. 70. This frame is made especially to attach to a wagon rack; only the saw frame is furnished and not the rack or wagon. The bracket boxes which carry the mandrel set are well babbitted and are mounted on a 2″x 10″ hardwood plank. The tilting table will swing saw blades up to 30″ diameter. The mandrel is 48″ long by $1\frac{1}{2}$″ diameter, turned down at one end to fit a saw blade with $1\frac{3}{8}$″ eye: pulley 5″ in diameter by 6″ face and balance wheel 60 lbs. Only four bolts are required to fasten the outfit to the wagon rack. Shipping weight 225 lbs. Code word, Pilot.



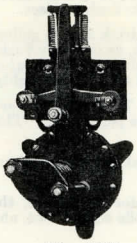
(Fig. 70)
Left Hand

Fig. 80. Sliding table wagon rack attachment to fit any wagon rack up to 38″ wide, can also be furnished. Shipping weight with 60-pound balance wheel, 260 pounds. Code word, Pinch.

A 75-lb., 95-lb. or 125-lb. balance wheel can be furnished with saw mandrels or wagon rack attachments when so ordered.

Diaphragm Type "F" "Electro-Pneumatic" Controller

This instrument, as shown in cut, is all that is needed for the control of motors up to and including the following capacities:



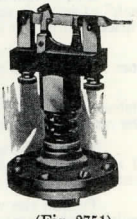
(Fig. 1566)
Type "F"

Single Phase Motors	2 or 3 Phase Squirrel Cage Motors	Compound D. C. Motors
2 H. P. 110 V. 4 H. P. 220 V.	3 H. P. 110 V. 5 H. P. 220 V.	1 H. P. 110 V. or 220 V.

Type "F" controller can be used above 2 H.P. only where motor can be thrown onto line without objection from the local electric company. On D. C., suitable only for motors designed especially for throwing onto line.

The starting point can be set for any pressure from 10 to 55 lbs., and the stopping for any pressure between 21 and 40 lbs., above the starting point. The starting and stopping limits desired, also horsepower and voltage and type of motor to be controlled, **must** be stated in every order. For use with Pneumatic Water Systems a starting pressure of 40 lbs. and stopping pressure of 65 lbs. are recommended.

Full instructions are furnished with each controller so that the starting and stopping limits can be changed, if necessary.

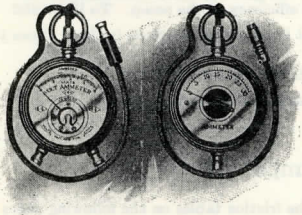


(Fig. 2751)
Pneumatic
Circuit Breaker.

Pneumatic Circuit Breaker

Adapted for use with pressure tank systems. Will positively stop any size of oil or gasoline engine when the desired maximum pressure is reached.

The mission of this water system attachment is to prolong life of engine, pump and fixtures which cannot be overtaxed, thus becoming a source of revenue and a profitable investment. Made in one size. Fitted for ¼" pipe.



Pocket Volt-Ammeter Pocket Ammeter

Ignition Accessories

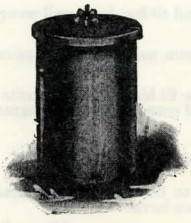
Battery Testing Instruments

Indispensable for determining exact condition of battery. Their use will reduce battery expense. Size of an ordinary watch, nickel-plated.

The Pocket Ammeter, with range from 0 to 30 amperes. Code word—Pocam.

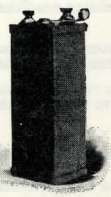
The Pocket Volt-Ammeter, with range from 0 to 8 volts and 0 to 30 amperes. Code word—Volam.

Primary Batteries

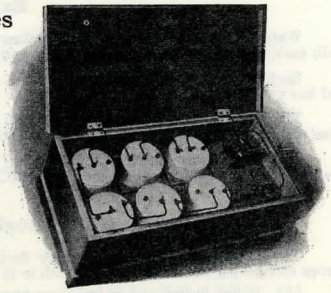


Zinc-Copper Oxide
Battery, Single Cell

Eclipse
Dry Battery



Spark
Coil



Zinc-Copper Oxide Battery
Six Cell

Zinc-Copper Oxide Batteries

This is recommended as the best battery on the market. Furnished in either porcelain or steel cells.

Eclipse Dry Batteries

These dry cell batteries are furnished in two sizes, 2½" by 6" and 3½" by 8". They can be furnished in single, dozen or barrel lots. Ten small or five large cells constitute a complete set, except for "Eclipse" Engines, which take 4 cells of 6 inch batteries. These can be supplied in a neat Battery Box at slight extra expense.

Spark Coils

Can furnish in two sizes, viz.: for the Dry Battery and for the Zinc-Copper Oxide Battery.

Useful Information and Formulae for Calculating Pump Problems

A gallon of water weighs 8⅓ pounds and contains 231 cubic inches. A cubic foot of water weighs 62½ pounds and contains 1,728 cubic inches, or 7½ gallons; 31½ gallons of water constitute a barrel; 1½ gallons fill an ordinary lavatory; 30 gallons fill the average bath tub. It requires about 7 to 10 gallons to flush a closet.

Horses drink 5 to 10 gallons per day. Cattle drink 7 to 12 gallons per day. Hogs drink 2 to 2½ gallons per day. Sheep drink 1 to 2 gallons per day. With 40 to 50 pounds pressure per square inch, an ordinary ¾-inch garden hose nozzle requires about 6 gallons per minute, when throwing a solid stream, or about 4 gallons when spraying. It requires about 8 gallons to sprinkle 100 square feet of lawn; 16 to 20 gallons will soak it thoroughly.

A cubic foot per second equals 450 gallons per minute. An acre-foot is 325,829 gallons. The term "miner's inch" of water is more or less indefinite, but is approximately equal to a flow of 11¼ gallons per minute. This varies in different states from about 9 to 13 gallons per minute.

Diameter of a circle multiplied by 3.1416 = circumference. Circumference multiplied by .3183 = diameter. The square of the diameter multiplied by .7854 = area.

To find the diameter of a pump cylinder required to move a given quantity of water per minute, the piston travel being 100 feet per minute, divide the number of gallons by four, then extract the square root, and the result will be the diameter in inches.

To find the area of required pipe, the volume of water being known, multiply the number of cubic feet of water by 144 and divide the product by the velocity in feet per minute. This gives the area of pipe, from which it is easy to determine the diameter.

To find the velocity in feet per minute necessary to discharge a given volume of water in a given time, multiply the number of cubic feet of water by 144 and divide the product by the area of the pipe in inches.

In figuring the actual horse power required to operate a pump, the "friction head" should be added to the "actual head," or elevation. This is given in the table on the preceding page.

Using the above formulae and including the "friction head," will give the theoretical horse power. To figure the actual horse power required it is necessary to know the efficiency of the pump. To illustrate:

If the efficiency of a small pump is 33⅓ per cent, the actual horse power required is three times the theoretical.

If the efficiency is 50 per cent, the actual horse power is double the theoretical.

If the efficiency is 66⅔ per cent, the actual horse power is 1½ times the theoretical, etc.

Power to Drive Pumps

The following supposed conditions will illustrate the use of the friction tables on the following pages

Existing Conditions

Water desired to be pumped, 80 gallons per minute; well, 12 feet deep; pump situated 50 feet from the well; tank situated 400 feet from the pump and at 80 feet elevation.

Suction pipe, 3-inch diameter, and from existing conditions is 12 feet in well and 50 feet from well pump, and has two 3-inch elbows.

Discharge pipe is 2½-inch diameter, and from existing conditions is 400 feet from pump to tank foundations and 80 feet from foundations to tank, and has three 2½-inch elbows.

Therefore, power must be provided (A) to raise the water 12 feet + 80 feet = 92 feet; (B) to overcome the friction of the water in pipes and elbows; (C) to overcome the friction in pump and connections to the engine.

What Size Engine is Suitable for This Work

The calculations are simplified by finding the "friction heads" equivalent to the losses in pipes and pumps and taking the actual head, which is 12 feet + 80 feet = 92 feet. Therefore we have

(A) 12 feet in well and 80 feet from ground to tank = Actual Head..... = 92 ft.

(B)
- 3-in. pipe friction = 12 ft. + 50 ft. = 62 ft. and by pipe friction table..... $\frac{62}{100}$x2 = 1.24 ft.
- Two 3-in. elbows = by elbow friction table..... 2 x0.184 = 0.368 ft.
- 400 ft. + 80 ft., 2½-in. pipe = 480 ft. = from pipe friction table..... $\frac{480}{100}$x4.6 = 22.08 ft.
- Three 2½-in. elbows = by elbow friction table..... 3 x0.4508 = 1.3524 ft.

Total of (B) or friction actual head pump has to work against..... =117.0404 ft.

(C) Pump friction. This varies greatly with different pumps and conditions, but must not be taken for less than ⅓ to ½ of (A) + (B). Taking it at ½ it is ..... $\frac{117.04}{2}$ = 58.52

Therefore, the engine must be able to drive pump to lift 80 gallons 175.56 feet high in 1 minute, or, expressed in H. P.= $\frac{80 \times 8\frac{1}{3} \times 175.56}{33{,}000}$ = 3.56 H. P.

Grand Total =
- (A) 92.00 ft.
- (B) 25.04 ft.
- (C) 58.52 ft.

175.56 ft.

8⅓ lbs. = weight of gallon of water.
33,000 = number of foot lbs. per minute in one H. P.

Table of Capacity of Pumps

The figures at the extreme right and left of the table are piston, or plunger, diameters; the line of figures across the top are piston, or plunger, strokes; the figures in the body of the table are the capacity, or displacement, in gallons, corresponding to a single stroke. To find the capacity for one revolution, multiply the capacity for a single stroke by one, two, three or four for single, duplex, triplex or quadruplex, single-acting, and by two, four or six for double-acting pumps.

Dia. of Cyl., In.	Area Circle, Square Inches	Length of Stroke in Inches, and Capacity of Stroke in Gallons, of Pump Cylinder with Given Diameter												Dia. of Cyl., In.
		4	5	6	8	10	12	14	15	16	18	20	24	
1¼	1.23	.0212	.0266	.0319	.0425	.0531	.0637	.0743	.0797	.0848	.0955	.1062	.1274	1¼
1⅜	1.48	.0256	.0321	.0385	.0513	.0642	.077	.089	.0963	.1027	.1156	.1280	.1541	1⅜
1½	1.77	.0306	.0382	.0459	.0612	.0765	.0918	.1071	.1147	.1224	.1377	.1530	.1836	1½
1¾	2.41	.0416	.0521	.0625	.0833	.1041	.1249	.1457	.1562	.1666	.1874	.2082	.2499	1¾
2	3.14	.0544	.068	.0816	.1088	.136	.1632	.1904	.204	.2176	.2448	.2720	.3264	2
2¼	3.98	.0688	.086	.1033	.1377	.1721	.2063	.241	.258	.2754	.3096	.3442	.4128	2¼
2½	4.91	.085	.1062	.1275	.17	.2125	.255	.2975	.3187	.34	.3825	.425	.51	2½
2¾	5.94	.1028	.1285	.1543	.2057	.2571	.3085	.3598	.3855	.4114	.4626	.5142	.617	2¾
3	7.07	.1224	.1530	.1836	.2448	.306	.3672	.4284	.459	.4896	.5508	.612	.7344	3
3¼	8.30	.1436	.1795	.2154	.2872	.5954	.4312	.503	.5385	.5748	.6466	.7182	.8624	3¼
3½	9.62	.1666	.2082	.2499	.3332	.4165	.4998	.5831	.6247	.6664	.7497	.833	.9996	3½
3¾	11.05	.1912	.239	.2868	.3824	.478	.5736	.6692	.687	.7648	.8605	.9561	1.147	3¾
4	12.57	.2176	.272	.3264	.4352	.544	.6528	.7616	.816	.8704	.9792	1.088	1.3056	4
4¼	14.19	.2456	.307	.3684	.4912	.6141	.7368	.8596	.921	.9824	1.105	1.228	1.473	4¼
4½	15.90	.2754	.3442	.4131	.5508	.6885	.8262	.9639	1.0327	1.1016	1.2393	1.377	1.6524	4½
4¾	17.73	.3068	.3835	.4602	.6136	.7671	.9204	1.073	1.15	1.2227	1.380	1.534	1.84	4¾
5	19.64	.34	.425	.51	.68	.85	1.02	1.19	1.275	1.36	1.53	1.7	2.04	5
5¼	21.65	.3748	.4685	.5622	.7496	.9371	1.124	1.311	1.405	1.499	1.686	1.874	2.228	5¼
5½	23.76	.4114	.5142	.6171	.8228	1.0285	1.2342	1.439	1.5427	1.6456	1.8513	2.057	2.4684	5½
5¾	25.97	.4496	.562	.6744	.8992	1.124	1.348	1.573	1.686	1.789	2.022	2.248	2.696	5¾
6	28.27	.4896	.612	.7344	.9792	1.2240	1.4688	1.7136	1.8362	1.9584	2.2032	2.448	2.9376	6
6¼	30.68	.5312	.6640	.7968	1.062	1.328	1.593	1.859	1.992	2.124	2.39	2.656	3.186	6¼
6½	33.18	.5744	.7182	.8610	1.1488	1.4364	1.7955	2.0109	2.1546	2.2982	2.5885	2.8728	3.4473	6½
6¾	35.79	.9196	.7745	.9294	1.239	1.549	1.858	2.168	2.323	2.47	2.788	3.098	3.716	6¾
7	38.49	.6664	.833	.9996	1.3328	1.666	1.9992	2.3324	2.499	2.6656	2.9988	3.332	3.9984	7
7¼	47.17	.8168	1.021	1.225	1.633	2.042	2.45	2.858	3.063	3.266	3.674	4.084	4.9	7¼

Table of THEORETICAL Horse Power Required to Raise Water to Different Heights

Add 50% to secure actual Horse Power required for average conditions

Gal. per Min.	FEET HEAD																				
	5	10	15	20	25	30	35	40	45	50	60	75	90	100	125	150	175	200	250	300	350	400
5	.006	.012	.019	.025	.031	.037	.044	.05	.06	.06	.07	.09	.11	.12	.16	.19	.22	.25	.31	.37	.44	.50
10	.012	.025	.037	.050	.062	.075	.087	.10	.11	.12	.15	.19	.22	.25	.31	.37	.44	.50	.62	.75	.87	1.00
15	.019	.037	.056	.075	.094	.112	.131	.15	.17	.19	.22	.28	.34	.37	.47	.56	.66	.75	.94	1.12	1.31	1.50
20	.025	.050	.075	.100	.125	.150	.175	.20	.22	.25	.30	.37	.45	.50	.62	.75	.87	1.00	1.25	1.50	1.75	2.00
25	.031	.062	.093	.125	.156	.187	.219	.25	.28	.31	.37	.47	.56	.62	.78	.94	1.09	1.25	1.56	1.87	2.19	2.50
30	.037	.075	.112	.150	.187	.225	.262	.30	.34	.37	.45	.56	.67	.75	.94	1.12	1.31	1.50	1.87	2.25	2.62	3.00
35	.043	.087	.131	.175	.219	.262	.306	.35	.39	.44	.52	.66	.79	.87	1.08	1.31	1.53	1.75	2.19	2.62	3.06	3.50
40	.050	.100	.150	.200	.250	.300	.350	.40	.50	.50	.60	.75	.90	1.00	1.25	1.50	1.75	2.00	2.50	3.00	3.50	4.00
45	.056	.112	.168	.225	.281	.337	.394	.45	.51	.56	.67	.84	1.01	1.12	1.41	1.69	1.97	2.20	2.81	3.37	3.94	4.50
50	.062	.125	.187	.250	.312	.375	.437	.50	.56	.62	.75	.94	1.12	1.25	1.56	1.87	2.19	2.50	3.12	3.75	4.37	5.00
60	.075	.150	.225	.300	.375	.450	.525	.60	.67	.75	.90	1.12	1.35	1.50	1.87	2.25	2.62	3.00	3.75	4.50	5.25	6.00
75	.093	.187	.281	.375	.469	.562	.656	.75	.84	.94	1.12	1.40	1.69	1.87	2.34	2.81	3.28	3.75	4.69	5.62	6.56	7.50
90	.112	.225	.337	.450	.562	.675	.787	.90	1.01	1.12	1.35	1.68	2.02	2.25	2.81	3.37	3.94	4.50	5.62	6.75	7.87	9.00
100	.125	.250	.375	.500	.625	.750	.875	1.00	1.12	1.25	1.50	1.87	2.25	2.50	3.12	3.75	4.37	5.00	6.25	7.50	8.75	10.00
125	.156	.312	.469	.625	.781	.937	1.094	1.25	1.41	1.56	1.87	2.34	2.81	3.12	3.91	4.69	5.47	6.25	7.81	9.37	10.94	12.50
150	.187	.375	.562	.750	.937	1.125	1.312	1.50	1.69	1.87	2.25	2.81	3.37	3.75	4.69	5.62	6.56	7.50	9.37	11.25	13.12	15.00
175	.219	.437	.656	.875	1.093	1.312	1.531	1.75	1.97	2.19	2.62	3.28	3.94	4.37	5.47	6.65	7.66	8.75	10.94	13.12	15.31	17.50
200	.250	.500	.750	1.000	1.250	1.500	1.750	2.00	2.25	2.50	3.00	3.75	4.50	5.00	6.25	7.50	8.75	10.00	12.50	15.00	17.50	20.00
250	.312	.625	.937	1.250	1.562	1.875	2.187	2.50	2.81	3.12	3.75	4.69	5.62	6.25	7.81	9.37	10.94	12.50	15.72	18.75	21.87	25.00
300	.375	.750	1.125	1.500	1.875	2.250	2.625	3.00	3.37	3.75	4.50	5.62	6.75	7.50	9.37	11.25	13.12	15.00	18.75	22.50	26.25	30.00
350	.437	.875	1.312	1.750	2.187	2.625	3.062	3.50	3.94	4.37	5.26	6.56	7.87	8.75	10.94	13.12	15.31	17.50	21.87	26.25	30.62	35.00
400	.500	1.000	1.502	2.000	2.500	3.000	3.500	4.00	4.50	5.00	6.00	7.50	9.00	10.00	12.50	15.00	17.50	20.00	25.00	30.00	35.00	40.00
500	.625	1.250	1.875	2.500	3.125	3.750	4.375	5.00	5.62	6.25	7.50	9.37	11.25	12.50	15.62	18.75	21.87	25.00	31.25	37.50	43.75	50.00

No close estimate of power required can be made as slight variations in roughness of pipe and in condition of pump may mean a large variation in amount of power required.

Power Head Data

Table for determining the horse power of engine required to raise water to different heights and the size of Fairbanks-Morse power head to use. Also length of stroke and size of cylinder required.

Table No. 1. **Horse Power of Engine Required to Raise Water to Different Heights**

Gallons per Min.	FEET HEAD											
	10	15	20	25	30	35	40	45	50	60	75	90
20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.90
25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.94	1.12
35	.....	.....	.....	.....	.....	.....	.....	.....	.88	1.04	1.32	1.58
40	.....	.....	.....	.....	.....	.....	.....	.90	1.00	1.20	1.50	1.80
45	.....	.....	.....	.....	.....	.....	.90	1.02	1.12	1.34	1.68	2.02
50	.....	.....	.....	.....	.....	.87	1.00	1.12	1.24	1.50	1.88	2.24
60	.....	.....	.....	.....	.90	1.05	1.20	1.34	1.50	1.80	2.24	2.70
75	.....	.....	.....	.93	1.12	1.31	1.50	1.68	1.88	2.24	2.80	3.38
90	.....	.....	.90	1.12	1.35	1.57	1.80	2.02	2.24	2.70	3.36	4.04
100	.....	.....	1.00	1.25	1.50	1.75	2.00	2.24	2.50	3.00	3.74	4.50
125	.....	.93	1.25	1.56	1.87	2.18	2.50	2.82	3.12	3.74	4.68	5.62
150	.....	1.12	1.50	1.87	2.25	2.62	3.00	3.38	3.74	4.50	5.62	6.74
175	.87	1.31	1.75	2.18	2.62	3.06	3.50	3.94	4.38	5.24	6.56	7.88
200	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	7.50	9.00
250	1.25	1.87	2.50	3.12	3.75	4.37	5.00	5.62	6.24	7.50	9.38	11.24
300	1.50	2.25	3.00	3.25	4.50	5.75	6.00	6.74	7.50	9.00	11.24	13.50
350	1.75	2.62	3.50	4.37	5.25	6.12	7.00	7.88	8.74	10.52	13.12	.....
400	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	12.00	.....	.....
500	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.24	12.50	.....	.....	.....

Table No. 1—Continued.

Gallons per Min.	FEET HEAD										
	100	125	150	175	200	250	300	350	400	450	500
5	.....	.....	.....	.....	.....	.....	.....	.88	1.00	1.12	1.26
7	.....	.....	.....	.....	.....	.88	1.06	1.22	1.40	1.58	1.76
10	.....	.....	.....	.88	1.00	1.24	1.50	1.74	2.00	2.26	2.52
12	.....	.....	.90	1.06	1.30	1.44	1.80	2.12	2.60	2.72	3.02
15	.....	.94	1.12	1.32	1.50	1.88	2.24	2.62	3.00	3.40	3.78
20	1.00	1.24	1.50	1.74	2.00	2.50	3.00	3.50	4.00	4.54	5.04
25	1.24	1.36	1.88	2.18	2.50	3.12	3.74	4.38	5.00	5.66	6.70
35	1.74	2.16	2.62	3.06	3.50	4.38	5.24	6.12	7.00	7.94	8.82
40	2.00	2.50	3.00	3.50	4.00	5.00	6.00	7.00	8.00	9.08	10.08
45	2.24	2.82	3.38	3.94	4.40	5.62	6.74	7.88	9.00	10.22	11.34
50	2.50	3.12	3.74	4.38	5.00	6.24	7.50	8.74	10.00	11.34	.....
60	3.00	3.74	4.50	5.24	6.00	7.00	9.00	10.50	12.00	.....	.....
75	3.74	4.68	5.62	6.56	7.50	9.38	11.24	13.12	.....	.....	.....
90	4.50	5.62	6.24	7.88	9.00	11.24	13.50	.....	.....	.....	.....
100	5.00	6.24	7.50	8.74	10.00	12.50	.....	.....	.....	.....	.....
125	6.24	7.82	9.38	10.94	12.50	.....	.....	.....	.....	.....	.....
150	7.50	9.38	11.24	13.12	.....	.....	.....	.....	.....	.....	.....
175	8.74	10.94	13.30	.....	.....	.....	.....	.....	.....	.....	.....
200	10.00	12.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
250	12.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Table No. 2. **Gallons Per Minute**

Diameter of Cylinder in Inches	No. 1 Type "H" Pump Head, 38 Strokes per Min., to Take Full Capacity of 1 1-2 H. P. Engine or Motor			No. 2 Type "H" Pump Head, 30 Strokes per Min., to Take Full Capacity of 3 H. P. Engine or Motor		No. 4 Type "H" Pump Head, 27 Strokes per Min., to Take Full Capacity of 6 H. P. Engine or Motor		No. 8 Type "H" Pump Head, 25 Strokes per Min., to Take Full Capacity of 10 H. P. Engine or Motor	
	5″ Stroke	7½″ Stroke	10″ Stroke	10″ Stroke	12″ Stroke	16″ Stroke	20″ Stroke	20″ Stroke	24″ Stroke
1½	1.5	2.2	2.9	.....	.....	.....	.....	.....	.....
1¾	2.0	3.0	4.0	.....	.....	.....	.....	.....	.....
2	2.6	3.9	5.2	4.1	4.9	.....	.....	.....	.....
2¼	3.3	4.9	6.5	5.2	6.2	.....	.....	.....	.....
2½	4.0	6.1	8.1	6.4	7.6	9.2	11.5	.....	.....
2¾	4.9	7.3	9.8	7.7	9.3	11.1	13.9	.....	.....
3	5.8	8.7	11.6	9.2	11.0	13.2	16.5	15.3	18.4
3¼	6.8	10.2	13.7	10.8	12.9	15.5	19.4	18.0	21.6
3½	7.9	11.9	15.8	12.5	15.0	18.0	22.5	20.8	25 0
3¾	9.1	13.6	18.2	14.3	17.2	20.6	25.9	23.9	28.7
4	10.3	15.5	20.7	16.3	19.6	23.5	29.4	27.2	32.6
4¼	.....	.....	.....	.....	.....	26.5	33.2	30.7	36.8
4½	.....	.....	.....	.....	.....	29.9	37.2	34.4	41.3
4¾	.....	.....	.....	.....	.....	33.0	41.4	38.4	46.0
5	.....	.....	.....	.....	.....	36.7	45.9	42.5	51.0
5¼	.....	.....	.....	.....	.....	40.5	50.6	46.9	55.7
5½	.....	.....	.....	.....	.....	44.4	55.5	51.4	61.7
5¾	.....	.....	.....	.....	.....	48.3	60.7	56.2	67.4
6	.....	.....	.....	.....	.....	52.9	66.1	61.2	73.4
6½	.....	.....	.....	.....	.....	.....	.....	71.8	86.2
7	.....	.....	.....	.....	.....	.....	.....	83.5	100.0
7½	.....	.....	.....	.....	.....	.....	.....	95.7	114.8
8	.....	.....	.....	.....	.....	.....	.....	108.8	130.6

To determine the size of pump head required, if the requirements are for pumping a certain number of gallons per minute to a certain height in feet, find from Table No. 1 the actual horse power necessary to meet the requirements. From Table No. 2 the number of the pump head can be determined, from the horse power, as well as the size of cylinder necessary for supplying the required number of gallons.

Acres Irrigated by Varying Quantities of Water

Making due allowance for evaporation, it requires 28,320 gallons of water to irrigate one acre one inch deep. The following table taken from Government tests shows the number of acres irrigated in 1, 10 and 24 hours, pumping various quantities, and irrigating various depths; local conditions, of course, vary and this table has been compiled from a comparison of various sections.

Gallons Pumped per Min.	Acres Irrigated in 1 Hour						Acres Irrigated in 10 Hours						Acres Irrigated in 24 Hours					
	1 In. Deep	2 In. Deep	3 In. Deep	4 In. Deep	5 In. Deep	6 In. Deep	1 In. Deep	2 In. Deep	3 In. Deep	4 In. Deep	5 In. Deep	6 In. Deep	1 In. Deep	2 In. Deep	3 In. Deep	4 In. Deep	5 In. Deep	6 In. Deep
600	1.3	.6	.4	.3	.2	.2	13.2	6.6	4.4	3.3	2.6	2.2	31.8	15.9	10.6	7.9	6.3	5.3
824	1.8	.9	.6	.4	.3	.3	18.2	9.1	6.0	4.5	3.6	3.0	43.7	21.8	14.5	10.9	8.7	7.3
944	2.1	1.0	.7	.5	.4	.3	20.8	10.4	6.9	5.2	4.1	3.4	50.0	25.0	16.7	12.5	10.0	8.3
988	2.2	1.1	.7	.5	.4	.3	21.8	10.9	7.2	5.4	4.3	3.6	52.4	26.2	17.4	13.1	10.4	8.7
1000	2.2	1.1	.7	.5	.4	.3	22.1	11.0	7.3	5.5	4.4	3.7	53.0	26.5	17.6	13.2	10.6	8.8
1200	2.6	1.3	.9	.6	.5	.4	26.5	13.2	8.8	6.6	5.3	4.4	63.6	31.8	21.2	15.9	12.7	10.6
1500	3.3	1.6	1.1	.8	.6	.5	33.1	16.5	11.0	8.2	6.6	5.5	79.5	39.7	26.5	19.9	15.9	13.2
2000	4.4	2.2	1.4	1.1	.9	.7	44.2	22.1	14.7	11.0	8.8	7.3	106.0	53.0	35.3	26.5	21.2	17.6

It requires from 10 inches to 20 inches of water per acre to produce a crop by irrigation, the average being 16 inches. The actual amount required depends upon the crop and the season.

Friction of Water in Clean Iron Pipes

Feet Head to be added to each 100 feet of Pipe
ELLIS & HOWLAND'S EXPERIMENTS

Gallons per Min. Delivered	¾ In.	1 In.	1¼ In.	1½ In.	2 In.	2½ In.	3 In.	3½ In.	4 In.	5 In.	6 In.
5	7.6	1.9	.71	.27	.09	.05	.01	....	....	....	....
10	29.9	7.3	1.4	1.0	.28	.09	.05	.01	....	....	....
15	66.0	16.1	5.5	2.2	.57	.18	.09	.05	.02	....	....
20	115.	28.0	9.5	4.8	.96	.32	.13	.07	.03	.01	....
25	179.	43.7	14.7	6.0	1.7	.48	.23	.09	.05	.02	.01
30	264.	63.2	21.0	8.6	2.1	.69	.30	.14	.07	.03	.01
35	372.	85.1	28.9	11.6	2.7	.92	.39	.20	.11	.04	.02
40	461.	110.	37.0	14.9	3.7	1.2	.53	.25	.14	.05	.02
45	594.	145.	46.5	18.7	4.6	1.5	.64	.32	.16	.07	.02
50	....	185.	57.3	23.0	5.6	1.9	.80	.39	.20	.09	.03
60	....	253.	82.8	32.2	8.0	2.7	1.2	.55	.30	.11	.05
70	....	340.	116.	46.0	11.0	3.5	1.4	.87	.44	.16	.06
75	....	393.	129.	51.4	12.2	4.1	1.7	.90	.48	.17	.07
80	....	442.	147.	57.5	14.5	4.6	2.0	.93	.53	.18	.07
90	....	580.	184.	73.6	17.9	5.9	2.5	1.1	.60	.21	.09
100	....	....	228.	89.7	21.7	7.3	2.9	1.5	.74	.27	.11
125	....	....	367.	150.	34.3	10.0	4.6	2.1	1.2	.39	.16
150	....	....	516.	207.	48.8	16.1	6.5	3.1	1.6	.57	.23
175	....	....	....	294.	64.6	21.7	8.6	4.2	2.1	.78	.30
200	....	....	....	359.	86.2	28.6	11.5	5.4	2.8	.96	.39
250	....	....	....	600.	137.	41.7	17.7	8.5	4.3	1.5	.60
300	....	....	....	....	195.	64.4	25.7	11.5	6.2	2.1	.85
350	....	....	....	....	258.	86.8	34.9	16.3	8.4	2.9	1.1
400	....	....	....	....	345.	114.	44.9	21.3	10.9	3.7	1.5

Table for Converting Feet Head of Water into Pressure per Square Inch

Feet Head	Pounds per Square Inch	Feet Head	Pounds per Square Inch	Feet Head	Pounds per Square Inch
1	.43	55	23.82	190	82.29
2	.87	60	25.99	200	86.62
3	1.30	65	28.15	225	97.45
4	1.73	70	30.32	250	108.27
5	2.17	75	32.48	275	119.10
6	2.60	80	34.65	300	129.93
7	3.03	85	36.81	325	140.75
8	3.40	90	38.98	350	151.58
9	3.90	95	41.14	375	162.41
10	4.33	100	43.31	400	173.24
15	6.50	110	47.64	500	216.55
20	8.66	120	51.97	600	259.85
25	10.83	130	56.30	700	303.16
30	12.99	140	60.63	800	346.47
35	15.16	150	64.96	900	389.78
40	17.32	160	69.29	1000	433.09
45	19.49	170	73.63	....	....
50	21.65	180	77.96	....	....

Friction of Water in Elbows

Feet Head to be added for each Elbow
Table based Weisbach's Formula for very short bends

Gallons per Min. Deliv'd	PIPE SIZES—INSIDE DIAMETER ¾	1	1¼	1½	2	2½	3	3½	4	5	6
5	.161	.0621	.0184	.0115	.0046	....	....	....	....	....	....
10	.644	.2162	.0713	.0414	.0138	.0069	....	....	....	....	....
15	1.449	.4876	.1587	.092	.0322	.0115	....	....	....	....	....
20	2.576	.8648	.2829	.1587	.0575	.0276	.0115	....	....	....	....
25	4.002	1.3455	.4462	.2484	.0874	.046	.0184	....	....	....	....
30	....	1.9435	.6394	.3611	.1265	.0644	.0253	....	....	....	....
35	....	2.645	.8740	.4935	.1748	.0851	.0345	.0207	....	....	....
40	....	3.450	1.1385	.6394	.2254	.1127	.046	.0253	.0161	....	....
45	....	4.370	1.4389	.8096	.2875	.1426	.0598	.0345	.0207	....	....
50	....	....	1.771	.989	.3519	.184	.0736	.0391	.023	....	....
60	....	7.774	2.553	1.426	.506	.2576	.1012	.0598	.0345	.0138	.0069
70	....	10.580	3.496	1.978	.6992	.3404	.138	.0805	.0483	.0207	.0092
75	....	12.190	4.002	2.254	.805	.3956	.1656	.092	.0552	.023	.0115
80	....	13.800	4.554	2.553	.9016	.4508	.184	.1012	.0621	.0276	.0115
90	....	17.480	5.750	3.243	1.150	.5704	.2392	.138	.0805	.0322	.0161
100	....	....	7.084	3.956	1.4076	.736	.2944	.1564	.0989	.0391	.0184
125	....	....	....	6.256	2.231	1.104	.460	.2576	.1541	.0621	.0299
150	....	....	....	9.016	3.197	1.5755	.6578	.368	.2208	.0897	.0437
175	....	....	....	12.236	4.370	2.1505	.8970	.5014	.3036	.1219	.0598
200	....	....	....	15.824	5.612	2.944	1.1776	.6266	.3956	.1564	.0736
250	....	....	....	....	8.878	4.393	1.840	1.0258	.6164	.2507	.1196
300	....	....	....	....	12.788	6.302	2.622	1.472	.8832	.3588	.1748

Table for Converting Pressure per Square Inch into Feet Head of Water

Pounds per Sq. In.	Feet Head	Pounds per Sq. In.	Feet Head	Pounds per Sq. In.	Feet Head
1	2.31	55	126.99	180	415.61
2	4.62	60	138.54	190	438.90
3	6.93	65	150.08	200	461.78
4	9.24	70	161.63	225	519.51
5	11.54	75	173.17	250	577.24
6	13.85	80	184.72	275	643.03
7	16.16	85	196.26	300	692.69
8	18.47	90	207.81	325	750.41
9	20.78	95	219.35	350	808.13
10	23.09	100	230.90	375	865.89
15	34.63	110	253.98	400	922.58
20	46.18	120	277.07	500	1154.48
25	57.72	125	288.62	....	....
30	69.27	130	300.16	....	....
35	80.81	140	323.25	....	....
40	92.36	150	346.34	....	....
45	103.90	160	369.43	....	....
50	115.45	170	392.52	....	....

Table showing Number of Gallons of Water Delivered and Height to which it will be Projected Through Nozzles

Pounds Pressure at Nozzle	Diameter of Nozzles ½-Inch Height Jet, Feet	½-Inch Gallons per Min	⅝-Inch Height Jet, Feet	⅝-Inch Gallons per Min	¾-Inch Height Jet, Feet	¾-Inch Gallons per Min.	⅞-Inch Height Jet, Feet	⅞-Inch Gallons per Min.	Pounds Pressure at Nozzle	Diameter of Nozzles 1-Inch Height Jet, Feet	1-Inch Gallons per Min	1¼-Inch Height Jet, Feet	1¼-Inch Gallons per Min	1½-Inch Height Jet, Feet	1½-Inch Gallons per Min.	1¾-Inch Height Jet, Feet	1¾-Inch Gallons per Min.
4.3	9.37	3.6	9.7	14.5	9.7	22.7	9.8	32.8	34.6	40.0	10.3	60.0	41.2	64.0	64.3	67.0	92.6
8.6	17.5	5.1	18.7	20.6	19.0	32.2	19.2	46.2	39.0	39.4	10.9	65.0	43.7	70.0	68.3	73.0	98.4
13.0	24.4	6.4	27.2	25.2	27.7	39.4	28 3	56.8	43.3	37.5	11.5	69.0	46.1	75.0	72.0	79.0	103.7
17.3	30.0	7.3	35.0	29.6	36.0	45.5	37.0	65.5	52.0	.....	....	75.0	50.4	84.0	78.8	90.0	113.5
21.6	34.0	8.1	42.2	32.5	44.0	50.9	45.0	73.3	60.6	.....	....	79.0	54.5	91.0	85.2	99.0	122.4
26.0	37.5	8.9	48.7	35.6	51.0	55.7	52.0	80.3	69.3	.....	....	80.0	58.1	96.0	90.8	106.0	131.2
30.3	39.0	9.6	55.0	38.5	58 0	60.1	60.0	86.8									

Electrical Units

Volt.—The unit of electrical motive force. Force required to send one ampere of current through one ohm of resistance.

The loss in transmission depends on the size and length of the wire.

Ampere.—Unit of current. The current which one volt can send through a resistance of one ohm.

Watt.—The unit of electrical energy, and is the product of the ampere and volt. That is, one ampere of current flowing under a pressure of one volt gives one watt of energy.

One electrical horse power is equal to 746 watts.

One kilowatt is equal to 1,000 watts.

To find the watts consumed in a given electrical circuit, such as a lamp, multiply the volts by the amperes.

To find the volts, divide the watts by the amperes.

To find the amperes, divide the watts by the volts.

To find the electrical horse power required by a lamp, divide the watts of the lamp by 746.

To find the number of lamps that can be supplied by one electrical horse power of energy, divide 746 by the watts of the lamp.

To find the electrical horse power necessary, multiply the watts per lamp by the number of lamps and divide by 746.

To find the mechanical horse power necessary to generate the required electrical horse power, divide the latter by the efficiency of the generator.

Horse-Power Leather Belting Will Transmit

Width of Belt, Inches	H. P. Per 100 Feet Belt-Velocity Single Belt	Double Belt	Width of Belt, Inches	H. P. Per 100 Feet Belt-Velocity Single Belt	Double Belt	Width of Belt, Inches	H. P. Per 100 Feet Belt-Velocity Single Belt	Double Belt
1	.09	.18	9	.82	1.64	20	1.82	3 64
2	.18	.36	10	.91	1.82	22	2.	4.
3	.27	.55	11	1.	2.	24	2.18	4.36
4	.36	.73	12	1.09	2.18	28	2.55	5.09
5	.45	.91	14	1.27	2.55	32	2.91	5.82
6	.55	1.09	16	1.45	2.91	36	3.27	6.55
7	.64	1.27	18	1.64	3.27	40	3.64	7.27
8	.73	1.46	.....	.....	.....	.....	.....	.....

In the calculations for horse powers in the above table the belt is assumed to run about horizontally; the arc of contact of smaller pulley has been considered as nearly 180°. Any reduction of this contact will make approximate proportional reduction of horse power.

Horse-Power of Shafts for Given Diameter and Speed

We publish herewith a table used in general practice for the transmission of power where shafts are properly supported.

When shafts are used for conveying power from one point to another, without any of the bending strains of pulleys, gears, etc., the next smaller size may be used.

This table must not be confounded with tables of actual strength of shafts published by other authorities.

Diameter of Shaft, Inches	REVOLUTIONS PER MINUTE 100	125	150	175	200	225	250	300	350	400
1 3/16	2.4	3.	3.6	4.2	4.8	5.4	6.	7.2	8.4	9.6
1 7/16	4.3	5.4	6.5	7.6	8.6	9.8	10.8	13.	15.2	17.2
1 11/16	6.5	8.	9.7	11.2	13.	14.6	16.	19.4	22.4	26.
1 15/16	10.	12.5	15.	17.5	20.	22.5	25.	30.	35.	40.
2 3/16	14.	17.8	21.	24.5	28.	31.5	35.6	42.	49.	56.

It is well to say, in this connection that no matter what general rules are adopted, there are frequently special cases in which the engineer or designer must depart from his rules and use his judgment in determining both the size of the shaft and the number and location of bearings.

To Determine the Size and Speed of Pulleys

You always know the diameter and speed of one pulley; let that represent the No. 1. From this you can calculate either the diameter or speed of No. 2.

To find Speed of Pulleys.—Multiply diameter of pulley No 1 by its revolutions per minute and divide by diameter of pulley No. 2. Result gives R. P. M. of pulley No. 2.

To find Diameter of Pulleys. Multiply diameter of pulley No. 1 by its revolutions per minute and divide by revolutions per minute made by pulley No. 2. Result gives diameter of pulley No. 2.

To find Length of Belts. When both pulleys are about the same size, add the diameter of the two pulleys together, multiply this result by 3.1416 and divide this by 2. To this quotient add twice the distance between centers of the shafts and this will give the required length.

FAIRBANKS, MORSE & CO.

(INCORPORATED)

Chicago, Ill.

Atlanta, Ga.
Baltimore, Md.
Boston, Mass.
Buenos Aires
Cincinnati, Ohio
Cleveland, Ohio
Dallas, Tex.
Denver, Colo.
Des Moines, Ia.
Detroit, Mich.
Indianapolis, Ind.
Jacksonville, Fla.
Kansas City, Mo.
London

Los Angeles, Cal.
Louisville, Ky.
Milwaukee, Wis.
Minneapolis, Minn.
New Orleans, La.
New York, N. Y.
Omaha, Neb.
Portland, Ore.
Salt Lake City, Utah
San Francisco, Cal.
Seattle, Wash.
Spokane, Wash.
St. Louis, Mo.
St. Paul, Minn.

The Canadian Fairbanks-Morse Co., Limited

Calgary
Edmonton
Hamilton
Montreal
Ottawa
Quebec
Saskatoon
St. John, N. B.
Toronto
Vancouver
Victoria
Winnipeg