

Double Friction Drum Direct Current Mining Hoist
With Band Brakes. For Mines, Inclines, and Tail-Rope Haulage

THE above engraving illustrates our latest pattern Double Drum Mining Hoist for direct current, which is simple in design, strong, efficient and durable, and has been thoroughly tested in service, many of them having been built, and all giving complete satisfaction. The drums, motor and controller are mounted complete on bed-plate. The Resistance Boxes are usually separate from Hoist, being conveniently located, so that the heat generated may not be annoying to the operator; but, in the case of the smaller sizes, it is sometimes desirable to have the machine completely self-contained and portable, and in this case the resistances are of special form and attached to the inside of bed-plate.

The Friction Drums are of our standard form and have all our latest patented improvements, and are described on page 71.

The Motor is of the armored type, made by the General Electric Company, and is strong, simple, efficient and compact. All moving parts are protected by suitable casing, so that they are not liable to injury from dust or moisture, which renders it especially adapted for hoisting purposes. The gearing from motor to intermediate shaft is cut, and is enclosed in an oil-tight gear case. The drum gearing is cast from our standard iron patterns, and is very accurate and smooth, and runs well. It is protected by means of our usual guard bands.

The Controller is of the railway type, and is mounted so as to be convenient for the operator. Each controller will be provided with a reversing switch, by which the motor can be reversed, so that, by throwing in the friction drums, one cage can be hoisted and the other lowered, thus accomplishing the same purpose as our standard mining hoist, described on page 73. The friction and brake levers are mounted in a rack with notched quadrants, and are fitted with thumb-latches.

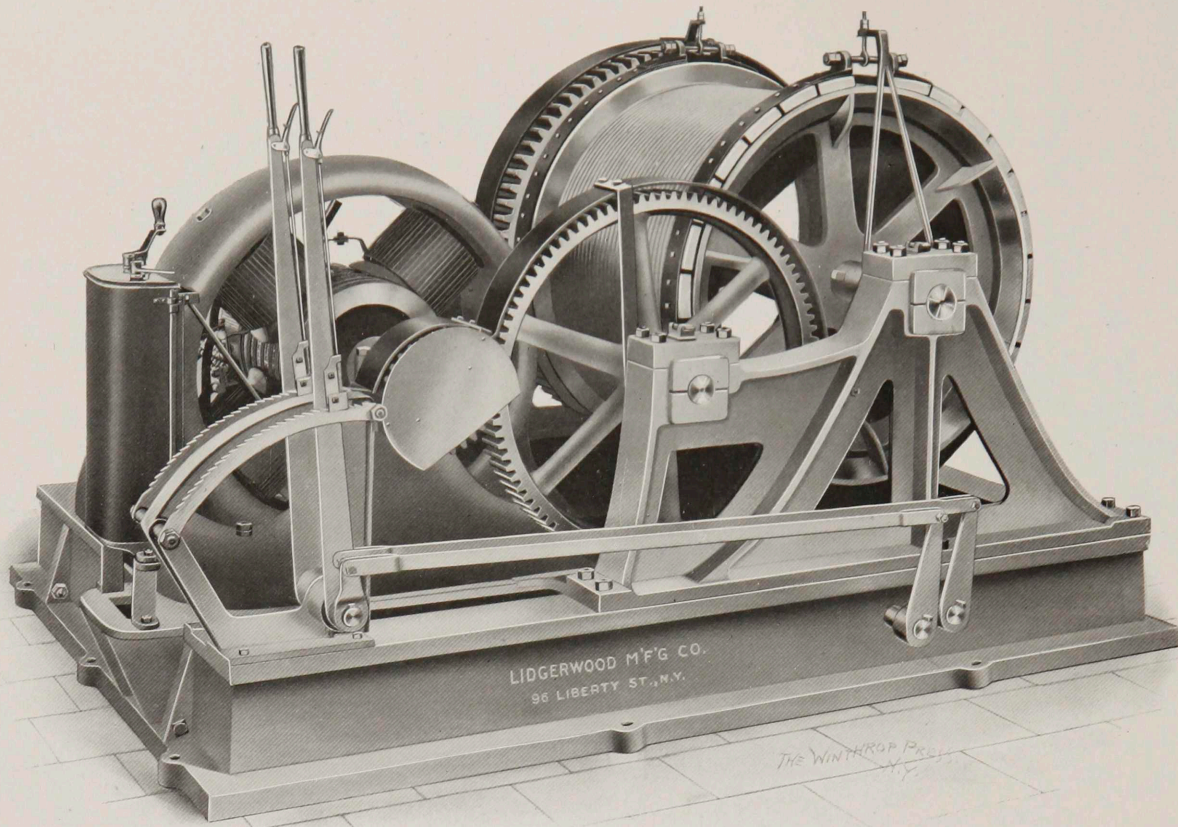
Vertical Indicators of our regular type are shown in the above engraving. They are not included in the standard machine, but can be furnished whenever desired, at an extra price. See page 82.

Particular attention has been given to the thorough insulation of all the electric parts of the hoist, and every hoist is thoroughly and completely tested, electrically, at our works before being shipped.

They are designed for use with a direct current of 500 or 250 volts, and ratings in table below apply to either voltage.

TABLE OF SIZES, ETC.

Number of Hoist	Motor Horse Power	Style of Motor	Dimensions of Hoisting Drums		Diameter Rope for which Drums are Grooved	Hoisting Duty		Estimated Shipping Weight of Hoist Complete Lbs.	Price Complete
			Diameter Inches	Face Inches		Weight Hoisted Lbs.	Speed in Feet per Minute		
558	25	G. E. 52	30	24	3/4	2000	300	12500	
559	40	G. E. 58	42	30	7/8	2500	400	17850	
560	50	G. E. 57	48	30	1	2500	500	23225	
561	75	G. E. 51	54	36	1	4000	500	31900	
562	90	G. E. 55	54	36	1	4000	600	33750	
563	115	G. E. 55	60	36	1	5000	600	45525	
564	115	G. E. 55	60	36	1	6000	500	45525	
565	230	(2) G. E. 55	72	60	1 1/8	10000	750	70000	



Friction Drum Hoist with Multipolar Motor Direct Current, for Mines, Inclines, Etc.

THIS style of hoist is adapted for very severe hoisting duty where the work is practically continuous and the heating element in the motor becomes so serious that an enclosed type of motor is impracticable and an open motor is a necessity.

The drum, motor and controller are mounted complete on bed-plate. The resistance boxes are usually separate from hoist, being conveniently located so that the heat generated may not be annoying to the operator; but in the case of the smaller sizes it is sometimes desirable to have the machine completely self-contained and portable, and in this case the resistances are of special form and attached to the inside of bed-plate.

The friction drum is of our standard form and has all our latest patented improvements, and is described on page 107.

The Motor is of the well-known Multipolar type of the General Electric Company.

The gearing from Motor to intermediate shaft is cut. The drum gearing is cast from our standard iron patterns, is very accurate and smooth, and runs well. The Gears are protected by means of our usual guard band.

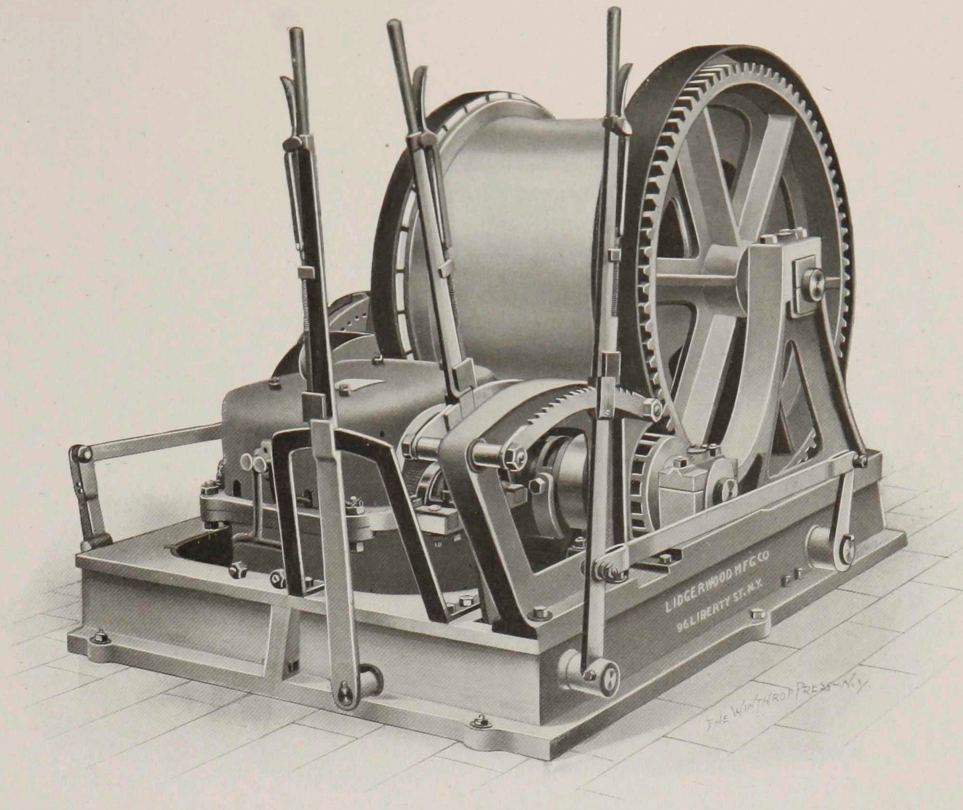
The controller is of the railway type, and is mounted so as to be convenient for the operator. Each controller will be provided with a reversing switch, which can be used or not, as desired. The friction and brake levers are mounted in a rack with notched quadrants, and are fitted with thumb-latches.

Particular attention has been given to the thorough insulation of all the electric parts of the hoist, and every hoist is thoroughly and completely tested electrically at our works before being shipped.

They are designed for use with a direct current of 500 or 250 volts, and ratings in table below apply to either voltage.

TABLE OF SIZES, ETC.

Size Number of Hoist	Motor Horse Power	Style of Motor	Dimensions of Hoisting Drums		Hoisting Duty		Estimated Shipping Weight Lbs.	Price Complete
			Diameter Inches	Face Inches	Weight Hoisted Lbs.	Speed in Feet per Minute		
531½	10	C.E. 4-10-860	12	15	1000	250	4200	
532½	15	C.E. 4-15-685	24	20	1500	250	5700	
533½	25	C.L. 6-25-690	30	24	2000	300	9600	
534½	30	C.L. 6-30-675	42	36	2500	300	11500	
535½	50	C.L. 6-48-650	48	40	3000	400	15700	
536½	80	C.L. 6-80-575	53	40	4000	500	22500	
537½	95	C.L. 6-95-500	53	42	5000	500	26800	
538½	140	M.P. 6-140-550	60	44	7500	500	39000	
539½	285	M.P. 6-285-480	72	60	10000	750	71500	



Jaw Clutch and Brake Reversible Electric Mining Hoist
For Direct Current

THE above engraving represents our regular type of Electric Mining Hoist, having a jaw clutch on the pinion and made to operate as a reversible hoist; or by throwing out the clutch the cage or bucket can be lowered by the band brake in the usual way. This is sometimes preferable to the regular friction drum hoist in wet or damp mines where the hoist is located underground.

The drum is keyed fast to the shaft, and the pinion is loose, being engaged by a jaw clutch which slides on a feather. It is not so convenient or effective as a friction clutch, as it is impossible to throw it into gear when the machine is running at speed, and it is difficult to disengage with a load on the drum.

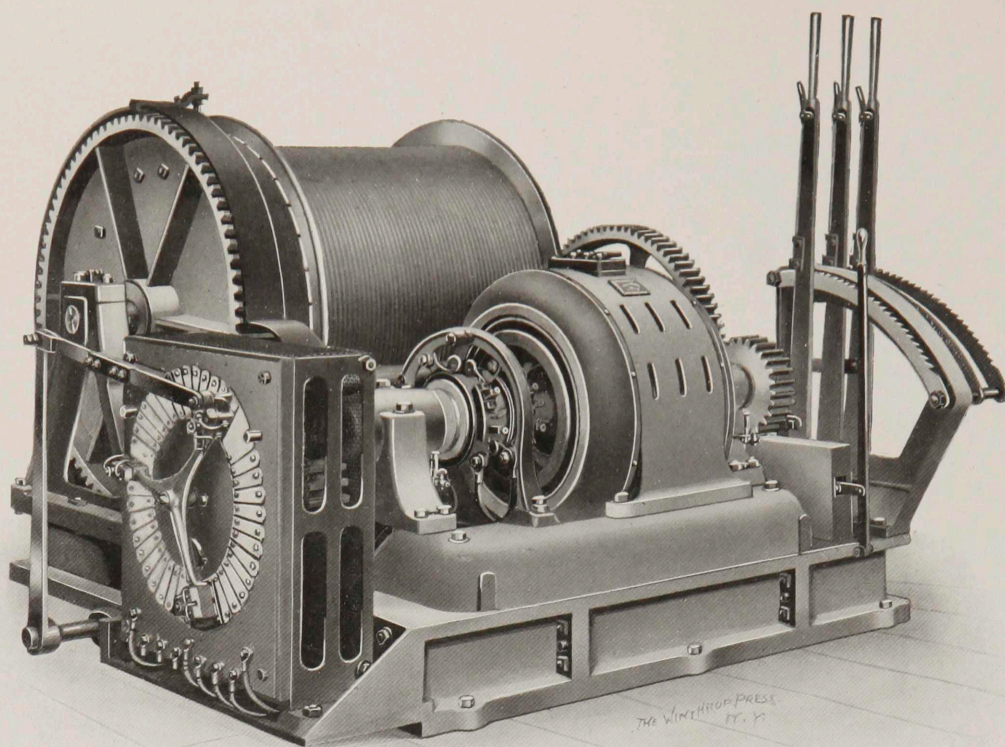
The motor, etc., are all described on page 107, and the only difference in the hoist lies in the method of clutching the drum.

They are designed for use with a direct current of 500 or 250 volts, and ratings in table apply to either voltage.

TABLE OF SIZES, ETC.

Size Number of Hoist	Motor Horse Power	Style of Motor	Dimensions of Hoisting Drum		Hoisting Duty		Estimated Shipping Weight of Hoist Complete Lbs.	Diameter of Rope for which Drum is Grooved	PRICE Complete
			Diameter Inches	Face Inches	Weight Hoisted Lbs.	Speed in Feet per Minute			
549	8	C. B. 14	12	15	1000	150	3900	Smooth 3/8 1/2 3/4 1 1 1 1	
550	17	G. E. 52	24	24	1500	250	5900		
551	25	G. E. 52	30	24	2000	300	7650		
552	40	G. E. 58	42	30	2500	400	11000		
553	50	G. E. 57	48	30	2500	500	13800		
554	75	G. E. 51	54	36	4000	500	18000		
555	90	G. E. 55	54	36	4000	600	18000		
556	115	G. E. 55	60	36	5000	600	24000		
557	115	G. E. 55	60	36	6000	500	24000		

Above Hoists are also made with **Double Drums.**



Patent Friction Drum Induction Motor Mining Hoist

For Mines, Inclines, Etc.

THE above engraving illustrates our regular Induction Motor Mining Hoist, with Patent Friction Drum and Brake. It is similar in all respects to the hoist described on page 114, with the exception of the motor, controller, etc.

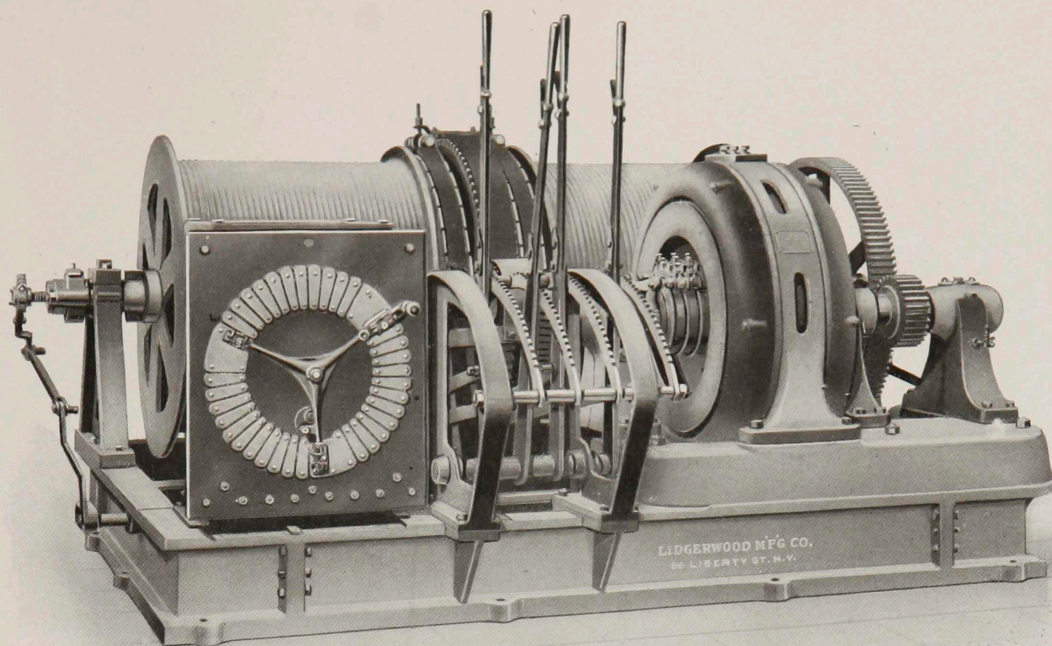
The motor is of the three-phase, induction type, provided with resistances in the armature circuit and external contacts for varying same. The motors may be wound for a voltage of 110, 220 or 500, and can be adapted for use on either two or three-phase systems. The controller is so constructed that a speed varying from maximum to zero can be obtained as readily as would be the case if a steam engine were employed.

These electric hoists are extremely well adapted for use in the interior of mines, the practice of a prominent coal-mining engineer being to drive his side tunnels with a slight up-grade, the electric hoists being located at the extreme end, and by this method the power is used for pulling the train of empty cars, which, when filled, are allowed to run out to the main track by gravity, under control of the drum brake. In this way the minimum of power is used.

In ordering these machines it is necessary to specify the system, whether two or three-phase, the cycles per second, and the primary voltage of the circuit.

TABLE OF SIZES, ETC.

Size No.	Motor Horse Power	Style of Motor	Dimensions of Hoisting Drum		Hoisting Duty		Estimated Shipping Weight Lbs.	Price Complete
			Diameter Inches	Face Inches	Weight Hoisted Lbs.	Speed in Feet per Minute		
531	10	I, 10- 10-720	12	15	1000	250	5100	
532	15	I, 12- 15-600	24	20	1500	250	6300	
533	20	I, 12- 20-600	30	24	2000	300	9600	
534	30	I, 16- 30-450	42	36	2500	300	15250	
535	50	I, 16- 50-450	48	40	3000	400	22000	
536	75	I, 16- 75-450	54	42	4000	500	25000	
537	100	I, 16-100-450	54	44	5000	500	32000	
538	150	I, 20-150-450	60	44	7500	500	39250	
539	300	I, 24-300-300	72	60	10000	750	65000	



Double Friction Drum Induction Motor Mining Hoist For Mines, Inclines, Tail-Rope Haulage, Etc.

THE above engraving illustrates our regular Patent Double Drum Induction Motor Mining Hoist, with band brakes.

It is similar to the hoist described on page 115, except the drums have **one central gear** instead of separate gears, and also with the exception of the electrical parts. They are adapted for use in double-compartment shaft mines, or for double track inclines, or for the usual tailrope haulage system, and are very simple and effective, numbers of them being in use with entire success.

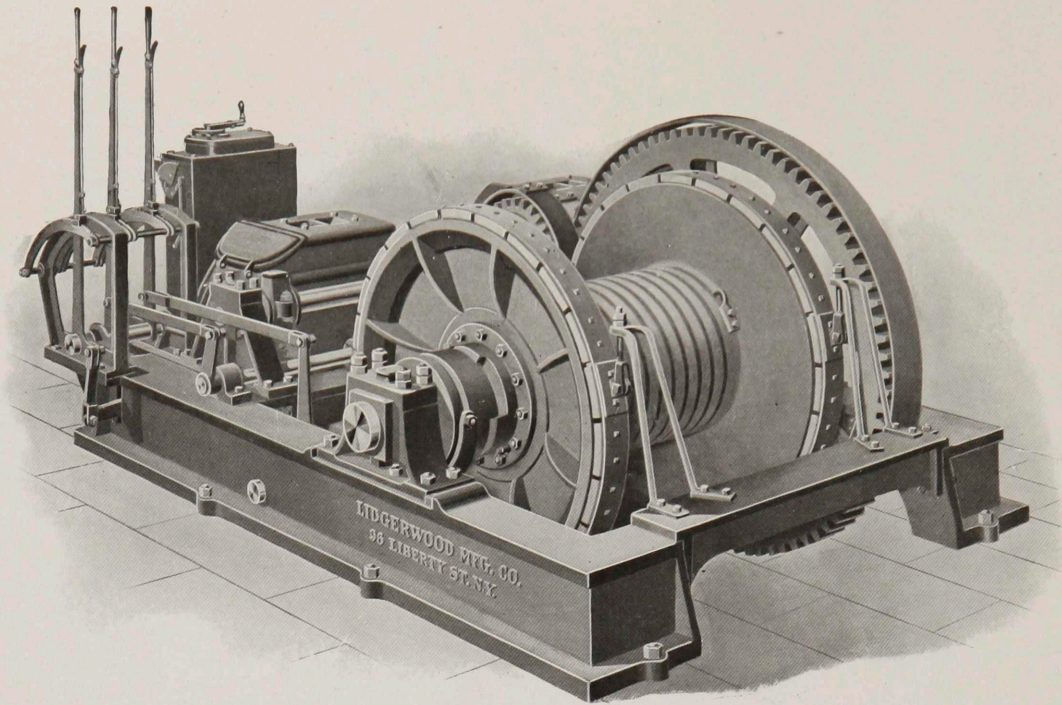
The motor is of the three-phase induction type, provided with resistances in the armature circuit and external contacts for varying same. The motor may be wound for a voltage of 110, 220, or 500, and can be adapted for use on either two or three-phase systems. The controller is so constructed that a speed varying from maximum to zero can be obtained as readily as would be the case if a steam engine were employed, and, by reversing the controller and throwing in the friction drums, one cage can be hoisted and the other lowered simultaneously. The machine will start and stop as readily as the regular direct-current hoist. It operates in the same manner as our steam hoist, described on page 74.

In ordering these machines, it is necessary to specify the system, whether two or three-phase, the cycles per second, and the primary voltage of the circuit.

TABLE OF SIZES, ETC.

Size Number of Hoist	Motor Horse Power	Style of Motor	Dimensions of Hoisting Drum		Hoisting Duty		Estimated Shipping Weight Lbs.	Price Complete
			Diameter Inches	Face Inches	Weight Hoisted Lbs.	Speed in Feet per Minute		
540	10	I, 10- 10-720	12	15	1000	250	5900	
541	15	I, 12- 15-600	24	20	1500	250	11500	
542	20	I, 12- 20-600	30	24	2000	300	14000	
543	30	I, 16- 30-450	42	30	2500	300	21000	
544	50	I, 16- 50-450	48	36	3000	400	29000	
545	75	I, 16- 75-450	48	38	4000	500	34600	
546	100	I, 16-100-450	54	40	5000	500	43000	
547	150	I, 20-150-450	64	40	7500	500	54500	
548	300	I, 24-300-300	72	58	10000	750	90000	

HOISTS WITH SEPARATE GEAR FOR EACH DRUM, AS SHOWN ON PAGE 115, ARE ALSO MADE.



Double Motor Electric Quarry Hoist

Especially Adapted for

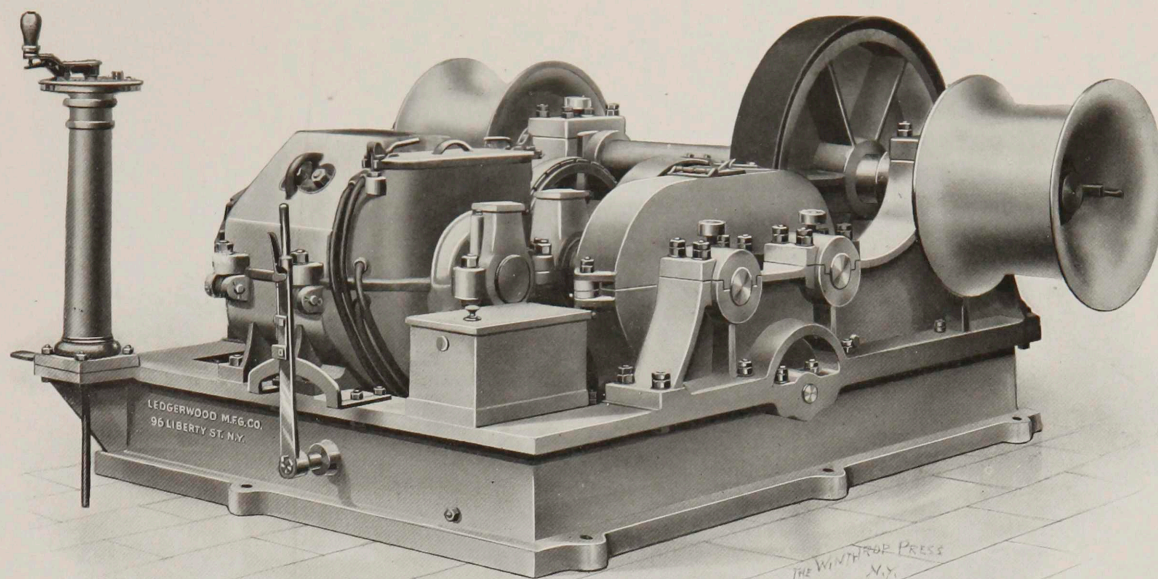
Heavy Hoisting Duty in Quarries, Yards, Factories, Etc.

THE above engraving illustrates a special type of Electric Hoist designed for hoisting heavy loads at varying speed. The drum is loose on the shaft and is operated by a very powerful spiral jaw clutch. It is grooved for either wire rope or chain, and is fitted with two independent band brakes of special design, which will lower any weight the hoist can handle, with ease and safety.

The gearing is compounded to obtain a speed of from 100 to 200 feet per minute on the drum, which is reduced about one-half by the action of the motors in series.

Two motors are used, which are of the regular direct current armored type, and the controller provides for connecting them in series or in multiple. By using them in multiple the maximum speed is attained, while by using them in series the speed is reduced about one-half—the lifting power remaining the same. This is the most effective and economical way in which direct current motors can be used for hoisting purposes. The above machine handles 15 tons on a single line. All sizes are made with one or more drums. Prices on application.

ELECTRIC HOISTS will be Designed for any SPECIAL WORK on Application.



Improved Electric Ship's Winch

(Patented)

THE two engravings on this page illustrate our new and improved form of Ship's Winch, which has been brought out to supply the demand for a thoroughly modern and first-class machine. It is operated by the latest form of armored motor of the General Electric Co., and has all improvements.

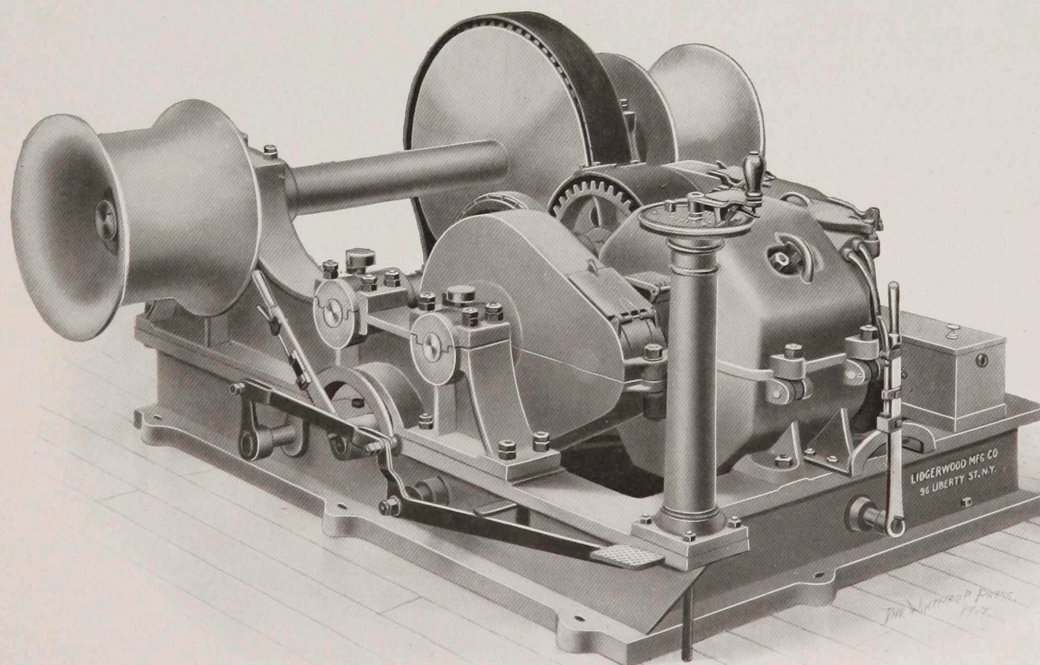
The controller is of the railroad type, and in the machines shown is located between decks, together with the resistances, while the operating handle is shown mounted upon a special post containing the contacts, etc.

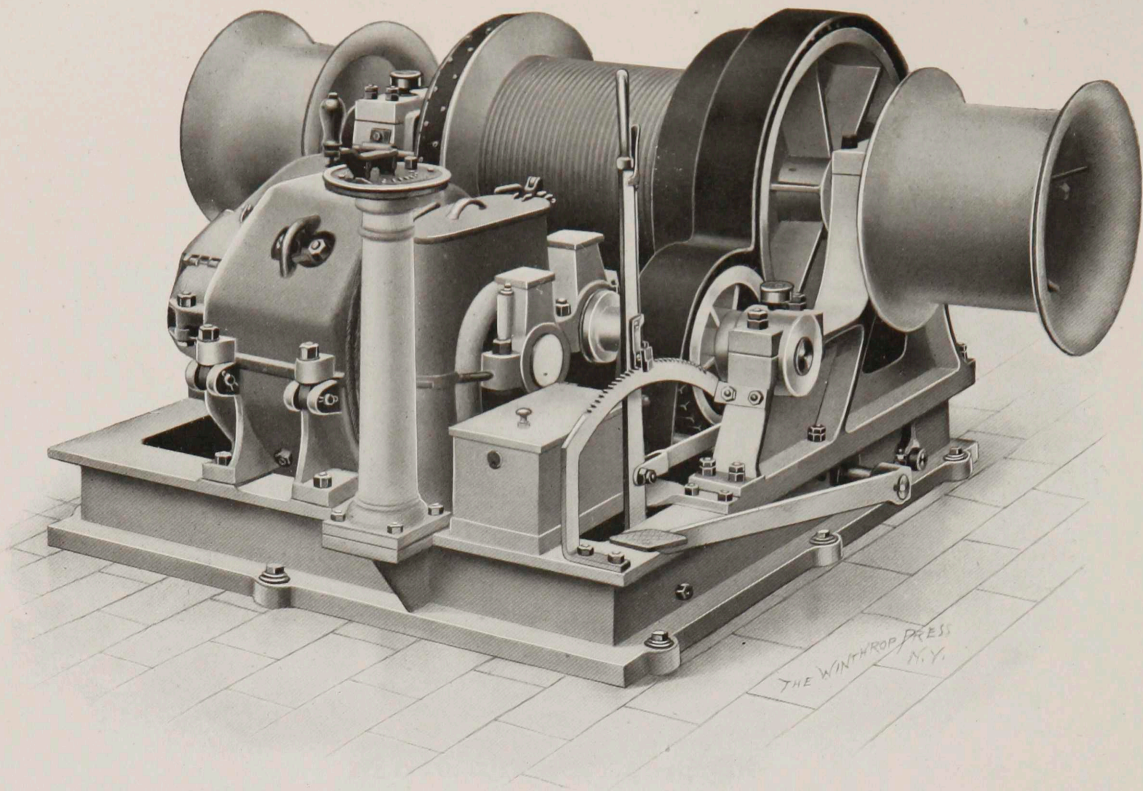
The winches are actuated by two sets of gearing, giving two different speeds, either being thrown in by moving the lever shown in the front of the machine. The lever has our regular thumb-latch and detent, engaging with notched quadrant.

The winches handle a load of 11,000 lbs., at a speed of 100 ft. per minute with the slow gear, and with the fast gear 3,500 lbs., at a speed of 300 ft. per minute. These, of course, can be changed to suit the conditions.

A most ingenious method of arranging the gears for the changes of speed has been adopted.

Four of these winches have been furnished to the new battleships, "Kearsarge" and "Kentucky."





Patent Electric Ship's Winch, with Friction Drum

(For Direct Current)

THE above engraving illustrates our new form of Ship's Winch, combined with Friction Drum, for general use on steamships, battleships, etc., where general hoisting is to be done. It differs from the winches on the opposite page in that it has no change of speeds, and is intended for lighter work.

The motor is of the latest pattern Armored Type of the General Electric Company, and is compound geared to the drum and winch heads. It is designed to give a rope-speed of 300 feet per minute with a load of 3,000 to 4,000 pounds, although it can be built for any required load and speed.

The controller is of the usual railway type, and is located between decks, together with the resistances, and operated by the special post, with handle and contacts shown. It can, if desired, be placed on the machine in place of the post, and our special packed plate resistances secured inside the bed-plate.

The drum is of our patent friction type, with differential band foot brake, but instead of the usual screw, pin and cross-key for operating the drum, a special patent arrangement of cams and anti-friction collars is used, which does away with any necessity for thrust-bearings and collars, as the entire end-thrust is taken between the gear and a fixed collar on the shaft. This makes the most perfect arrangement for operating a friction drum yet devised.

The winch heads are keyed fast to the drum shaft, and are turned and polished to reduce the wear on the rope. The drum being loose on the shaft, is independent of the winch heads in operation. This machine is especially adapted for use on battleships, cruisers, etc., in connection with the Temperly Transporter for Coaling at Sea. All parts of the machine are extra strong and durable, and the workmanship and material of the highest grade.

These hoists have been furnished for U. S. Battleships "Kearsage" and "Kentucky" and the Russian Battleship "Retvizan." Made in all sizes—for all voltages.

Suspension Cableways

For General Hoisting and Conveying Purposes

Especially adapted for

**Quarries, Dam Building, Canal Excavating, Open Pit Mining, Stone
Bridge Building, Fortification Work, Coal Handling, etc.**

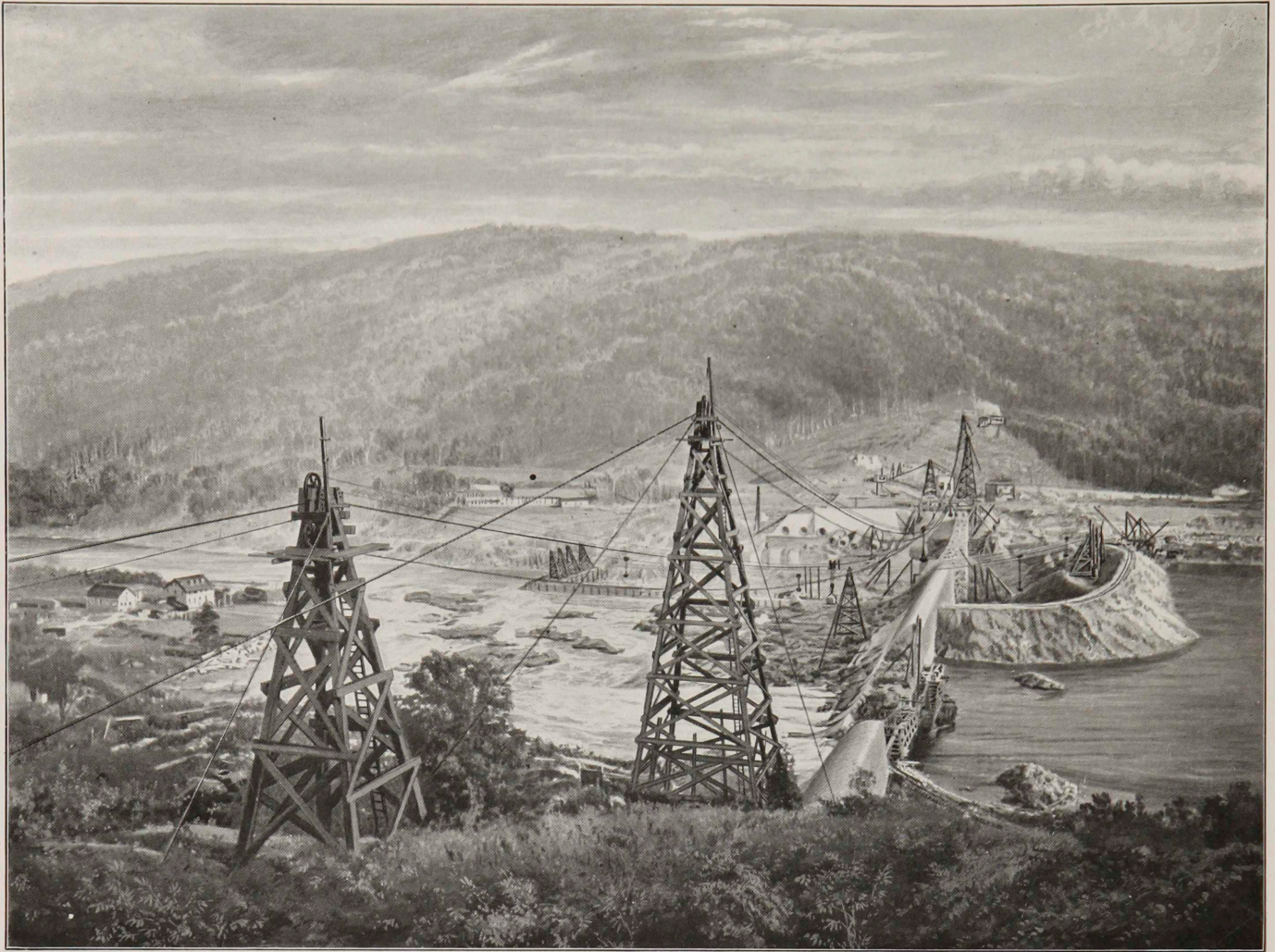
IT is now some fifteen years since the first cableway was installed by this Company under the Locke Patents at the Tilly Foster Iron Mines, at Brewsters, N. Y.; and while crude in its design and comparatively slow in operation, it at once demonstrated its usefulness for open pit mining, and enabled the ore to be handled at a much lower cost than by any previous method.

It was soon found that the speed and capacity of the Locke System were very limited, and that it had certain disadvantages in connection with supporting the hoisting or fall rope. A special Cableway Department was therefore organized with competent engineers, who devoted their entire time to the development of this method of hoisting and conveying, and as the result many remarkable improvements have been achieved.

Loads have been increased to 15 and 20 tons, spans from 800 to 2,100 feet, and traversing speeds from about 400 to 1,500 feet per minute. The "Aerial Dump," which enabled the skip to be unloaded in the air at any point without stopping, at once doubled the capacity of the cableway, and solved the problem of canal excavation. While originally only fixed towers were used, we now make them either one or both movable, and thus enable the cableway to act as a gigantic crane and cover a large area of ground. It is quite impossible in the present catalogue to do more than briefly describe the cableway, and we therefore request those interested in the subject to send for our

Cableway Catalogue

containing some 192 pages devoted entirely to our various methods of hoisting and conveying.



Standard Lidgerwood Cableway

Constructing Dam

The Hudson River Water Power Co.—Mr. E. L. Ashley, President. Mr. C. E. Parsons, C.E., Engineer

(There are at present employed on this work over 40 Lidgerwood Derricks and 7 Lidgerwood Cableways ; the longest being 2,140 ft. span, the greatest in the world.)

Locke-Miller Patent Horizontal Cableway

THE above engravings, together with those on the succeeding pages, give a general idea of the Locke-Miller Patent Cableway. This form of cableway is especially adapted for operation in a horizontal position, but may be inclined at any angle if so desired.

The main cable is of steel wire and is suspended from towers or "A" frames, and the ends securely anchored.

This cable serves as a trackway upon which a traveling carriage moves, and connected with which is a fall block for sustaining and raising the load. Three additional ropes are employed in this style of cableway—one for moving the carriage along the main cable and called the traversing or endless rope ; another, which is connected with the fall block and used for hoisting the load, and called the hoisting or fall rope ; and the third or button rope, which is used for displacing the fall-rope carriers from the carriage at regular intervals along the cable.

The traversing or endless rope is attached to each side of the carriage—on one side passing to the outer tower or "A" frame, and back to the inner tower where the engine is located, making half a dozen turns around the curved drum on the engine (or enough to secure friction) and thence back to the carriage, which serves as a link to connect the two ends, making it practically an endless rope; this rope is supported at the towers by suitable sheave wheels. By turning this endless rope drum in either direction the carriage is pulled along the cable either way as desired.

The endless rope is supported by the carriage and also by the fall-rope carriers.

The hoisting rope passes from its drum over a sheave wheel in the tower to the carriage, and there connects with the fall-block, usually by a three-part purchase, as shown by engravings of carriage on page 129. The hoisting rope is supported, by a system of **Fall-rope Carriers**, upon which the successful operation of the whole cableway depends. These carriers are of simple form, with small wheels for supporting the ropes, and are carried on a horn on one end of the carriage. As the carriage passes out on the main cable they are displaced by the buttons on the button rope one after the other at proper intervals for supporting the fall rope, and as the carriage returns they are picked up by the horn on the carriage.

OPERATION

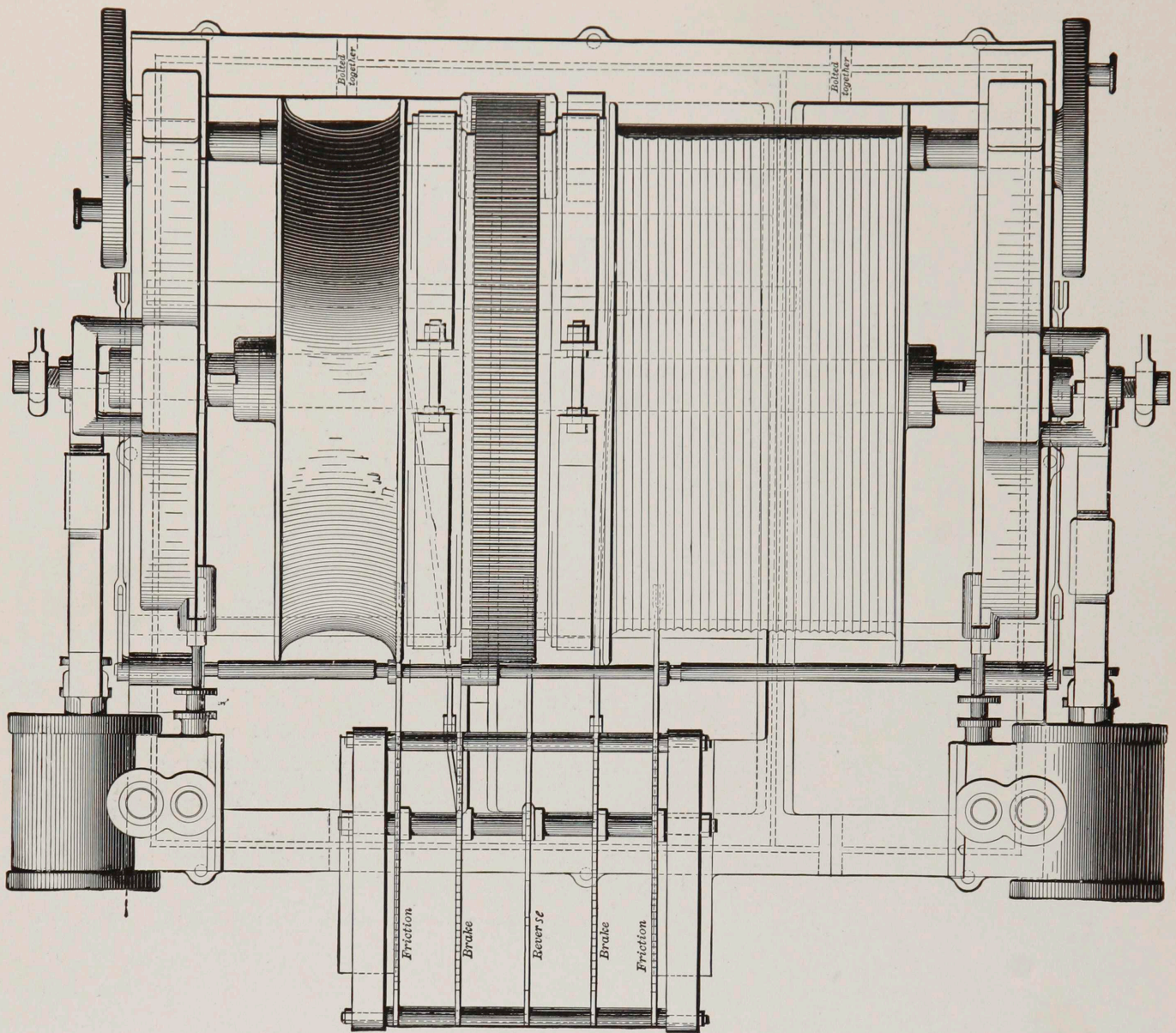
The engine is started, the endless rope drum is thrown into gear and the carriage is moved out upon the cable to any desired point. The endless rope drum is then thrown out of gear and the brake applied, thus holding the carriage immovably upon the cable. The fall-block is lowered and the load attached. The load is then hoisted high enough to clear any obstructions, the endless rope drum is thrown into gear and both drums winding their respective ropes at the same speed pull the carriage in as far as desired, when the load is lowered and landed.

The universal nature of the cableway is thus apparent, as material can be hoisted at any point on the cable and conveyed to any other point and lowered without any loss of time, and without the use of any shifting locks or catches, etc., and the fall-block can also be lowered by its own weight at any point on the cable—a most important consideration.

Any kind of material can be handled either by skips or buckets, or in the case of heavy stones, by chains or tongs. Loads of fifteen tons or more may be handled.

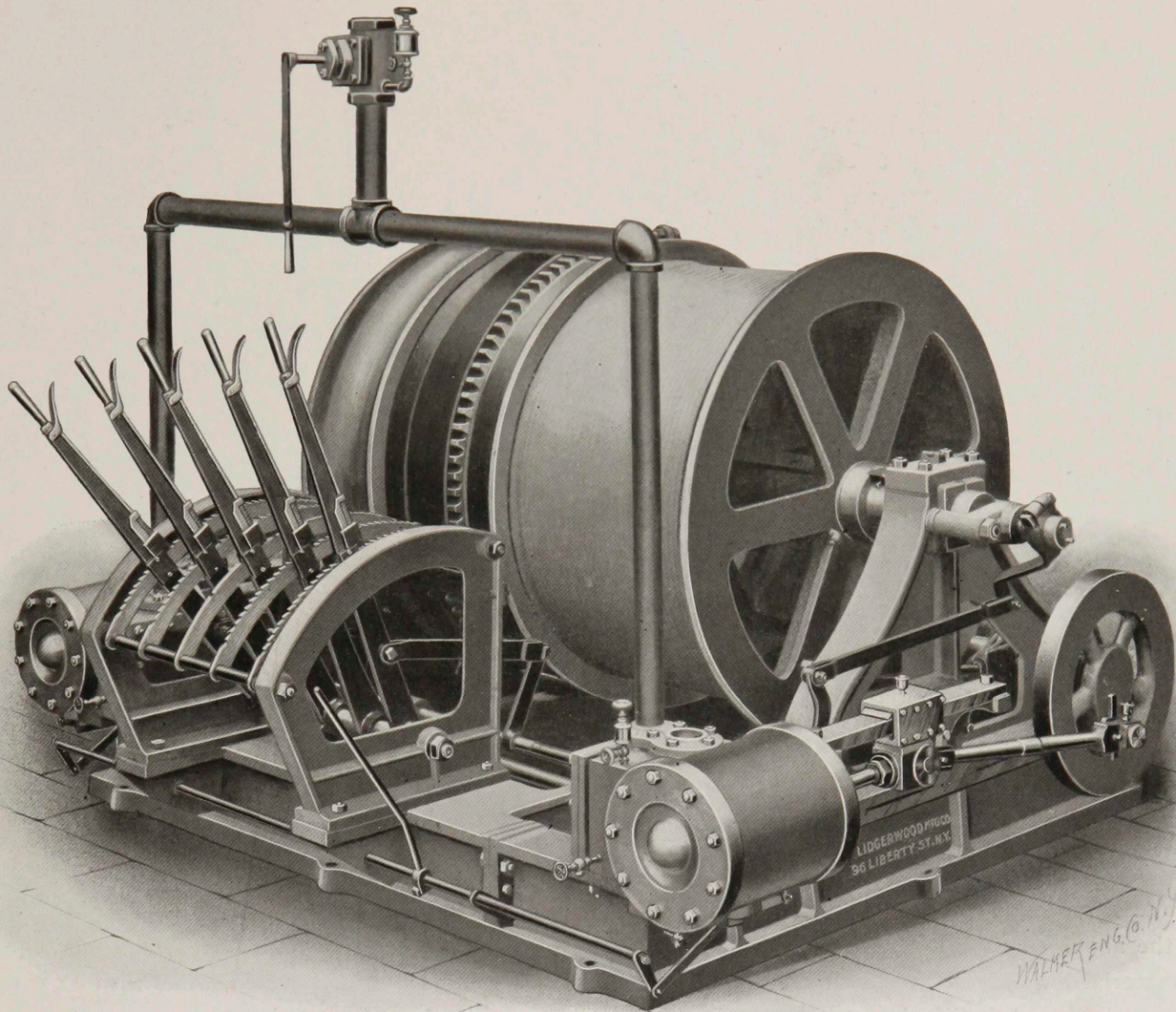
The entire operation is under the absolute control of the engineer, who, with a little practice can work the cableway so accurately as to lay cut stone with perfect ease. It is thus well adapted for dam building, or for the construction of long walls, breakwaters, etc. The cable being usually considerably higher than dam or walls, stones can be easily laid several yards either side of the perpendicular. For contractors' work, where rock excavations are to be made, or for canal excavation it is of especial value, for it not only will handle the earth and rock cheaper than by any other method, but it is out of the reach of a blast. If the cableway is constructed for heavy loads, it saves a large amount of extra work in breaking up the rock after the blast has been made, as it will carry away the rock in large pieces, while by using skips heavy loads of small rock and earth can be carried, and at the minimum cost for loading, as the skips are usually only eighteen inches high. It will readily drag a load at an angle of forty-five degrees from the cable and by using a snatch block the load can be dragged any distance.

Where the conditions of any class of work require transportation across a river the value of the cableway is too apparent to require any argument. This is also the case where stone abutments have to be constructed in a river. For all kinds of quarry work it is being used with great success, and loads of fifteen tons or more are picked up in the quarry and landed on cars with perfect ease and at a speed hitherto unknown. The power for operating the cableway consists of a specially designed hoisting engine having double cylinders, reversible link motion and double patent friction drums and brakes. Both drums are of precisely the same diameter, but one is narrow and of a curved form to receive the traversing or endless rope and the other is wider and spirally grooved for the hoisting rope. This engine is shown on pages 126 and 127. A similar hoist driven by one or two motors is built for operation by electricity.



Special Engine for Locke-Miller Cableway

THE above engraving and that on the opposite page show respectively a plan (or top view) and a perspective view of an engine especially designed to operate the Locke-Miller Horizontal Cableway described on the preceding pages. This engine has double cylinders, with cranks connected at an angle of ninety degrees, and is fitted with reversible link motion. The drums are of our regular patent friction type; one is spirally grooved to carry the hoisting rope, and the other is turned off smooth with a curved surface, as shown in the engraving, and carries the endless rope. The endless or traversing rope is wrapped around the drum four or more times—enough to secure sufficient friction to keep it from slipping in the opposite direction to that in which the drum is turning—and the ends are passed over sheave wheels on the "A" frames or towers and made fast to the front and rear of the traveling carriage. The carriage is moved in either direction—the engine being reversible—and as the endless rope on the curved drum begins to wind the natural tendency of the rope to climb the drum is resisted by the curved surface, which produces a slight lateral slipping of all the coils of rope on the drum. Thus the coils always remain nearly in the centre of the drum, the slipping of the coils being gradual and almost imperceptible. The wear on the rope produced by this slipping is not appreciable; in fact, in a case where the ropes have been in constant use about a year the endless rope shows no more wear than the hoisting rope, both being in first-class condition.



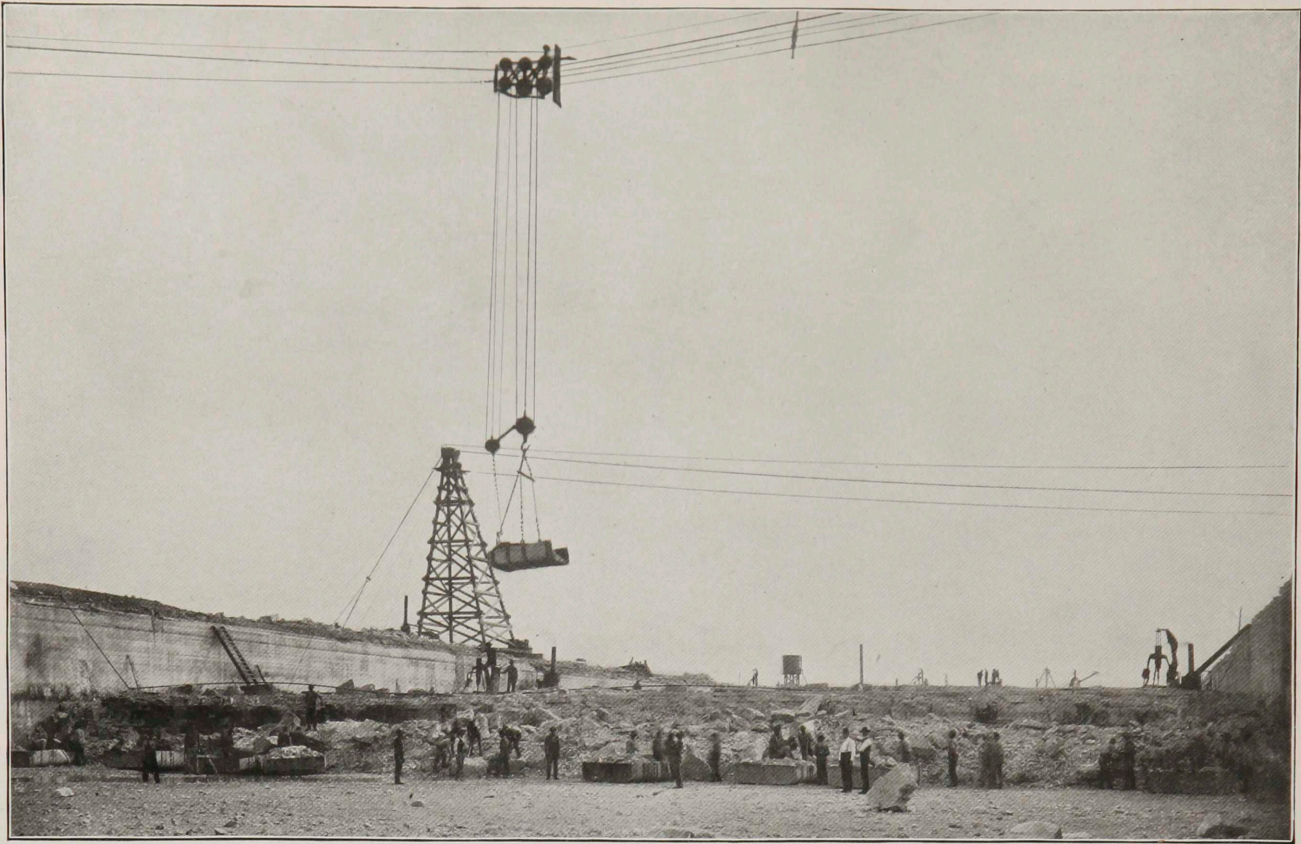
THIS drum is provided with a powerful band friction brake applied by means of a hand lever, as seen in the above engraving, and is self-acting, locking the drum securely, so that the carriage is held at any point desired while the load is being hoisted or lowered.

The hoisting drum is perfectly independent of the other, and being of the same diameter, winds at the same rate of speed and keeps the load at the same height if so desired. This drum also has a band brake by means of which the load can be held positively. It will thus be seen that this independent action of the drums gives the operator perfect command over the apparatus, as he can use them together, or can hold either of them and use the other.

The reversing lever, friction levers and brake levers are all brought to a central position, so that the operator can work all of them without difficulty. The reverse lever quadrant has the usual square notches, while the other quadrants are serrated, and the levers having catches operated by thumb-latches can be handled quickly, and will stay in any position in which they are placed. This saves a great deal of time in handling the engine, and adds to the general effectiveness of the apparatus.

The above is the usual type of engine for cableway use, but in many instances the tandem arrangement of drums is preferable, as shown on page 75. We also build many three drum engines to suit the requirements of cableways designed for special work.

Electric Hoists in all the various designs required for cableway purposes are also made—either for direct or alternating current.



Economy in Handling Material by a Cableway

IS due somewhat to the fact that a low box or skip can be used instead of cars or carts. This is shown in the above engraving. The skip has sides usually from twelve to eighteen inches high, and consequently the material has only to be lifted a short distance from the ground and thrown in, while with a car or cart the material has to be lifted from three to four feet. The men can do at least twice as much work as by the old method of loading into cars. Another advantage of the skip lies in the fact that men can work on all four sides of it at the same time, and large stone may be rolled into the open end. The ordinary skip is supported by three chains which are attached to the hook of the fall-block, one chain being fastened to front or open end of skip and two to the back end. In order to discharge the load the fall-block is lowered until the skip rests on the ground and the chains are all slack, when the chain at front or open end of the skip is unhooked, and by hoisting the fall-block the box is tilted and the material allowed to slide out. The empty skip is then carried back along the cable and deposited and a full skip picked up, which has been prepared while the other was in transit. Preferably, however, **our Aerial Dump** should be used, as it nearly doubles the capacity of the cableway and the utmost

Rapidity in Dumping

is attained. It is an extremely simple device, consisting of an auxiliary fall rope and block (shown in the above engraving and that on the opposite page), to which is attached a chain connecting with the rear chain of the skip. By pulling on this auxiliary rope the rear end of the skip is raised and the load dumped. This is accomplished by causing the dumping rope to travel at a higher speed than the hoisting rope. The drum or drums carrying both these ropes are of the same diameter, except a portion of the dumping rope drum, which is of an increased diameter, and a suitable device at the engine enables the operator to cause the dumping rope to climb to the increased diameter and thus dump the load at any place desired, while the carriage is in motion.



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AERIAL DUMP

of steel buttons secured to an auxiliary rope. The spaces in the carriers are graduated in size to correspond with the buttons on the button rope, so that each button will pass through every carrier except the one which it pulls off the horn. Thus the ropes will be perfectly supported at suitable intervals.

As the carriage returns towards the engine, the carriers are picked from the cable by the horn on the carriage.

The immense importance of these fall rope carriers will be seen when it is considered that if the fall rope were allowed to sag down it would simply be impossible to lower the fall block, and the cableway would be inoperative.

The use of the Miller carriers does not affect the *speed at which the cableway can be operated.*

We have abandoned the use of the Locke chain connected carriers which we illustrated in former catalogues, as they not only were heavy and cumbersome and gave trouble from entanglement and breakage of the chains, but they practically prohibited anything but slow speed, and thus reduced the capacity of the cableways and consequently their economy.

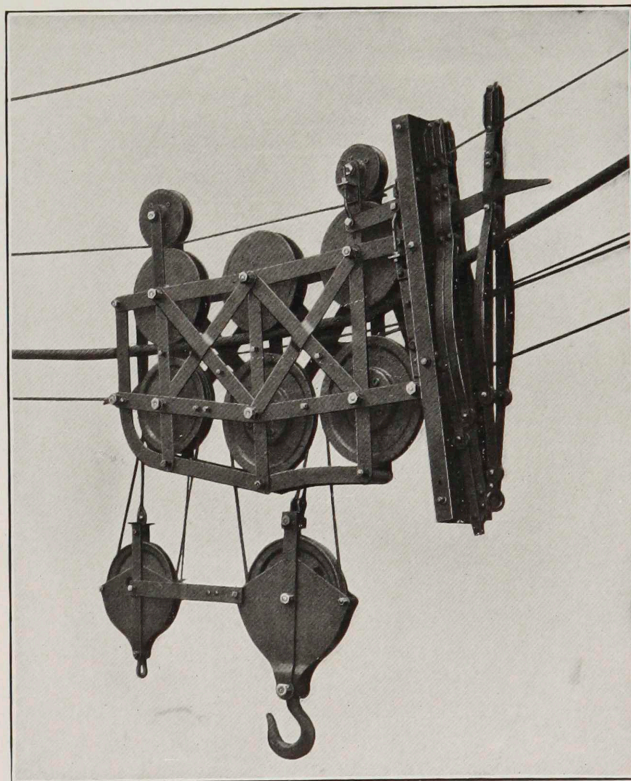
By reversing the engine the dumping rope unwinds until the skip is again level and thereafter travels at the same speed as the hoisting rope, enabling the skip to return and be lowered in a perfectly level position. This is of the greatest importance, as it enables the men to land the skip in its proper place quickly and safely, while if it were dangling in the ordinary position it would be more difficult to land and would waste a considerable amount of time.

The engraving on the opposite page is from a photograph of Section 8 of the Chicago Drainage Canal, where a capacity was attained of 600 cubic yards of rock per day—the skips holding about two cubic yards. Single rocks of nearly four cubic yards were also handled by chains, the skips being disconnected for that purpose.

Carriage and Fall Rope Carriers

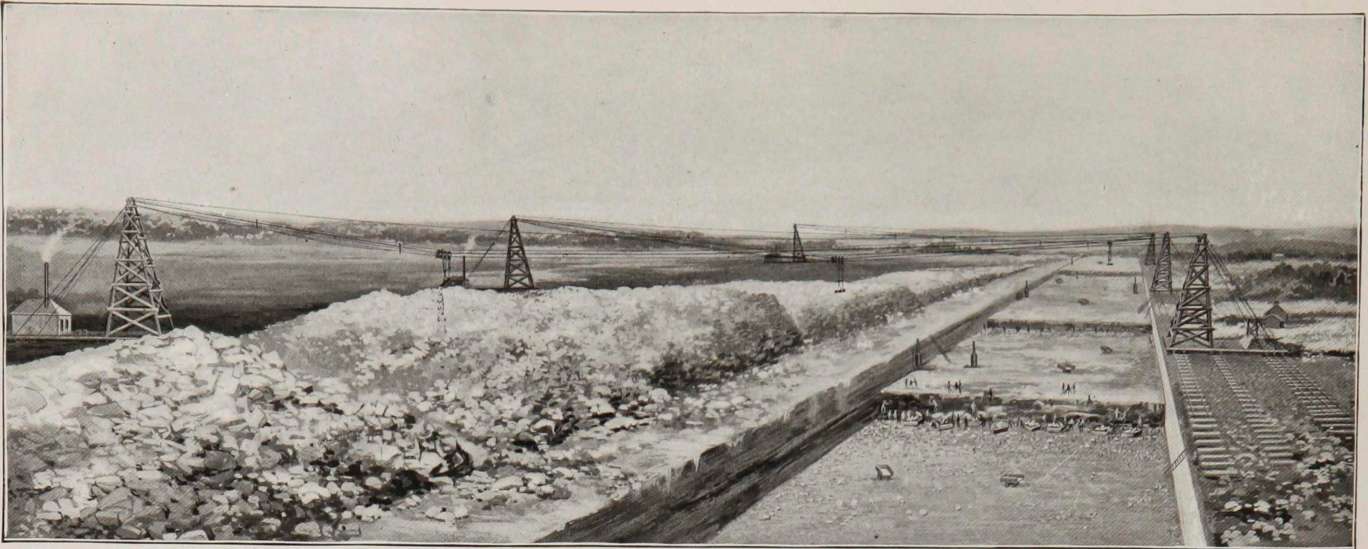
The carriage is made of the best material and workmanship and is as light as consistent with strength. The wheels are large, with deep flanges, and the journals are brass bushed with self-oiling bearings. The fall-block is usually arranged for three parts of rope, although any number of parts can be used if necessary.

The fall rope carriers are constructed of high-grade machine steel, are light and strong, and have suitable wheels for supporting all the operating ropes. They ride on the horn shown in front of carriage until they are displaced by means



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CABLE CARRIAGE AND FALL ROPE CARRIERS



Traveling Cableways

IN the excavation of the Chicago Drainage Canal it became necessary to use some device by which the material could be rapidly hoisted and conveyed to the spoil bank, and yet that was sufficiently portable to travel along the banks as fast as the work progressed. This led to the design of the Traveling Cableway, in which the towers were erected on large cars traveling on three tracks. The above engraving is from a photograph taken on the canal, showing three of the cableways. There were twenty of them used. Two small winch engines were used for moving the towers along the track.

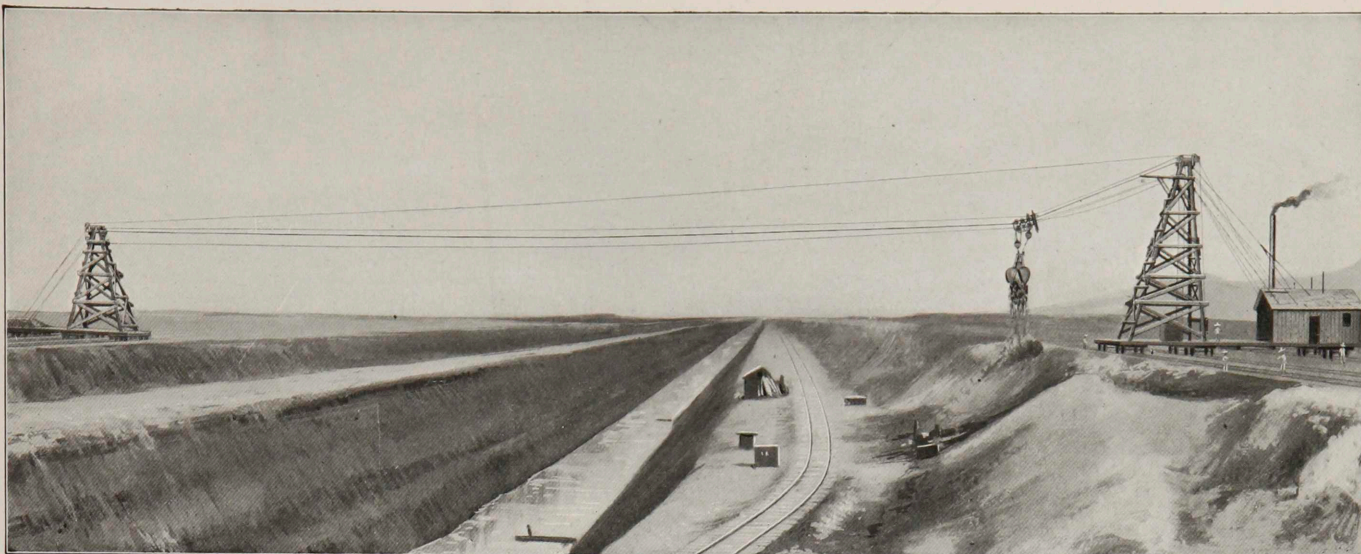
Since then we have made large numbers of various forms of Traveling Cableways designed for many special conditions, which have proved of the utmost value in reducing the cost of hoisting and conveying materials to a minimum. It is impossible to describe same in this, our general catalogue, and we therefore refer those interested to our Cableway Catalogue of 192 pages.



Traveling Cableway on New Gun Emplacement, Gerrish Island, Me.

ONE of our most interesting traveling cableways, purchased by Major S. W. Roessler, Corps of Engineers, U. S. A., was located on the fortification at Gerrish Island, Me. The span was 272 feet, and was designed for the handling of the excavated material as well as the concrete and sand filling. The cableway is capable of handling a 4-ton load, and of traveling both towers along their tracks, with full load, at the rate of 100 feet per minute. The main cableway engine has a special winch for moving the head tower, and on the tail tower a special moving engine and boiler are employed.

In this plant the traveling cableway may be defined as a high-speed, long-reach, traveling crane



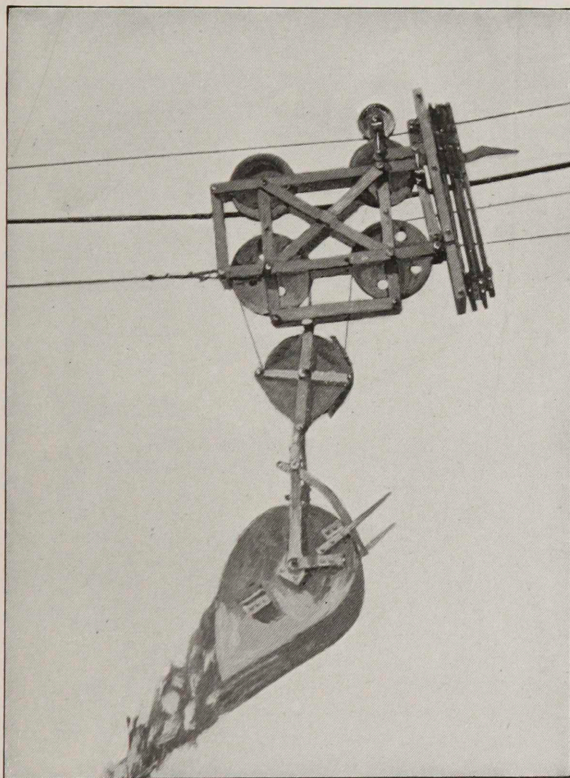
Dredging by Cableway

Lidgerwood Traveling Cableway on Mexican Drainage Canal

S. Pearson & Sons, London, Contractors

The above engraving illustrates a class of work for which the Traveling Cableway is adapted, and which can be accomplished with the minimum of expense. It was used by the world renowned firm of contractors named above, for excavating on the Great Mexican Drainage Canal. The self-filling bucket used with this Cableway

was of the Hayward "Orange Peel" Type. Another form of self-filling bucket is shown in the engravings below. It was designed for excavating for the

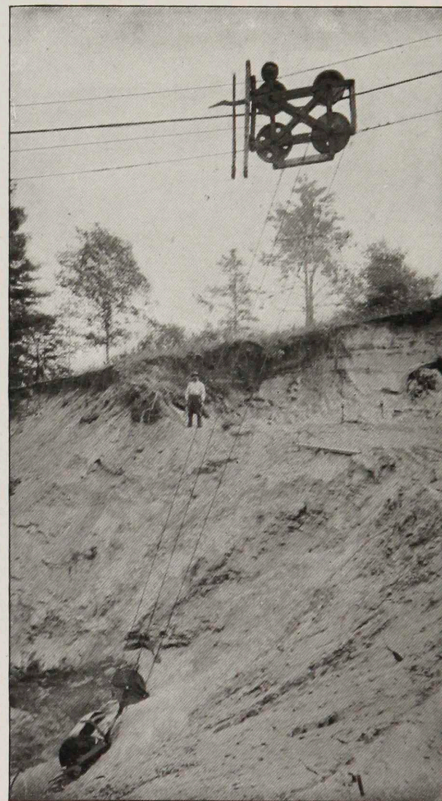


SELF-FILLING SCOOP BUCKET IN THE ACT OF DUMPING

Pennichunk Water-Works Dam

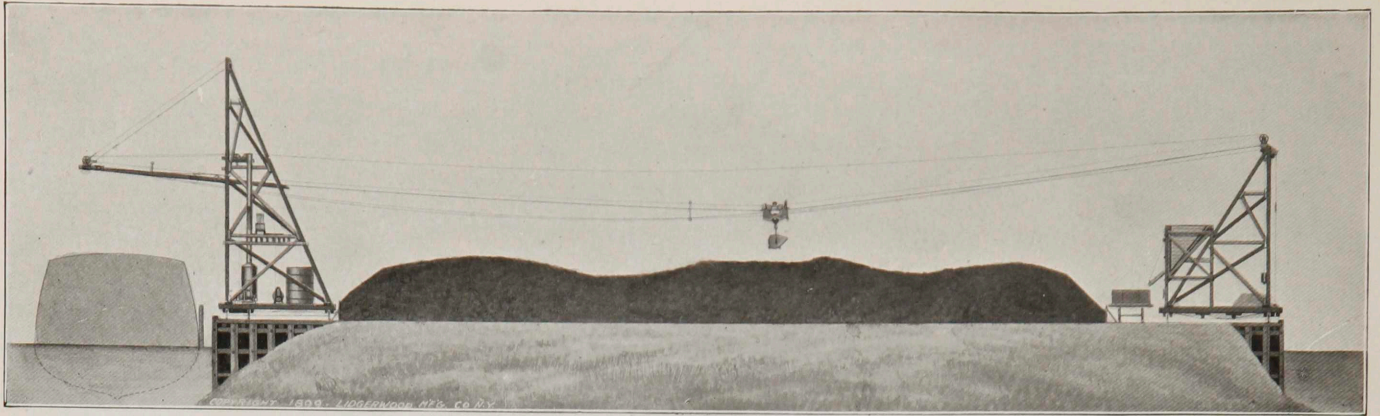
near Nashua, N. H., which was a curved earth dam with a rough masonry core, the rock being quarried from the bank on one side of stream and the sand and gravel for filling being taken from the other bank. The bucket was arranged to dump at different points along the Cable by a patent hooking and tripping device.

The small rocks were carried in a wooden skip, and larger ones up to 5 tons by chain slings. Span, 700 feet.



BUCKET FILLING IN GRAVEL BANK

Placer Mining by Cableway, with Self-Filling Drag Bucket, is readily accomplished by the use of this type of bucket and cableway, either radial or traveling



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Traveling Dock Cableway for Discharging Coal from Vessels and Reloading Plant System, Port Tampa, Fla.

WE were awarded the contract to build this cableway because it was the most economical hoisting and conveying machine known. The coal was not to be piled higher than twelve feet. It was to be discharged from boats to pier, to stock pile, and again rehandled from pier to barge or steamer, or from stock pile to bin for coaling locomotives. The towers were made of wood, but in a second plant they were constructed of steel. The span is 258 feet, including a 30-foot boom, and half-ton self dumping coal tubs are handled.

The Plant System coal dock is a long pier extending far out into the bay, the outer end of which is used for coal storage. The towers are mounted on the respective sides of the pier, on special tracks, so that the cableway commands the entire area of the dock, and it may be freely moved to any part of dock, or from one hatch of a vessel to another.

Double cables are used for a trackway, and the carriage passes freely from the cables over specially constructed saddles on to rigid tracks which end in a boom reaching out over the vessel. The boom may be raised to clear a vessel's rigging.

The head tower and cables are so arranged that the boom may be raised without releasing the tension in the operating ropes. Engine and boiler and all operating machinery are carried in the head tower. All levers are assembled in an elevated rack, so that the engineman has a clear view of the entire work.

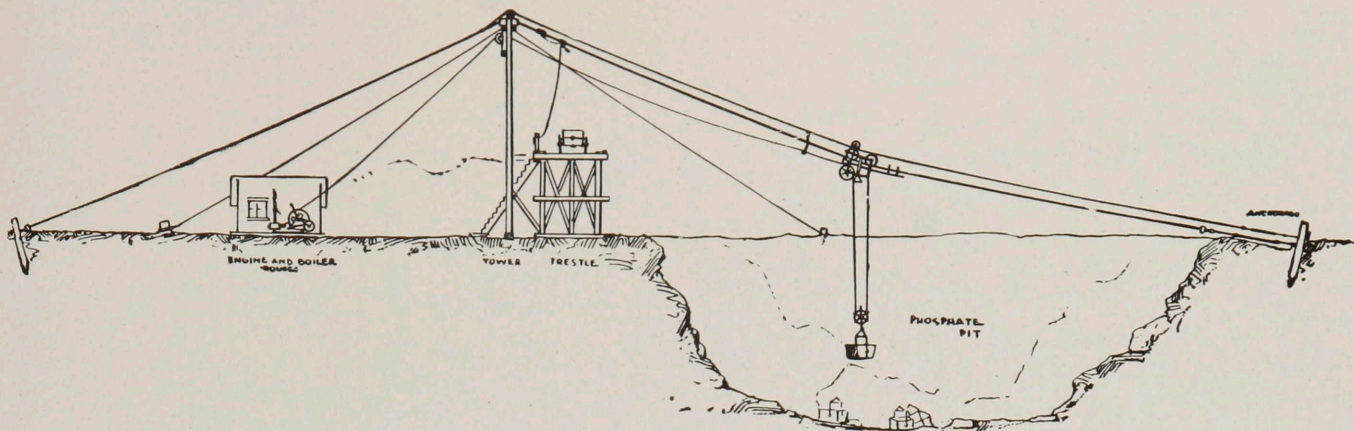
A recent letter from the Plant System at Port Tampa, referring to this cableway, states that "we have found it more economical than any other method of handling coal that we have so far tried."



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Coal Hoisting and Conveying Machine at Coal Docks of West End Street Railway, Boston, Mass.

THIS plant handles coal from vessel to dock, and may handle from dock to vessel. A two-rope clam-shell bucket of the simplest design fills itself in soft coal, hoists at 200 feet per minute, conveys its load at 400 to 500 feet per minute, and has handled 500 tons of coal per day.



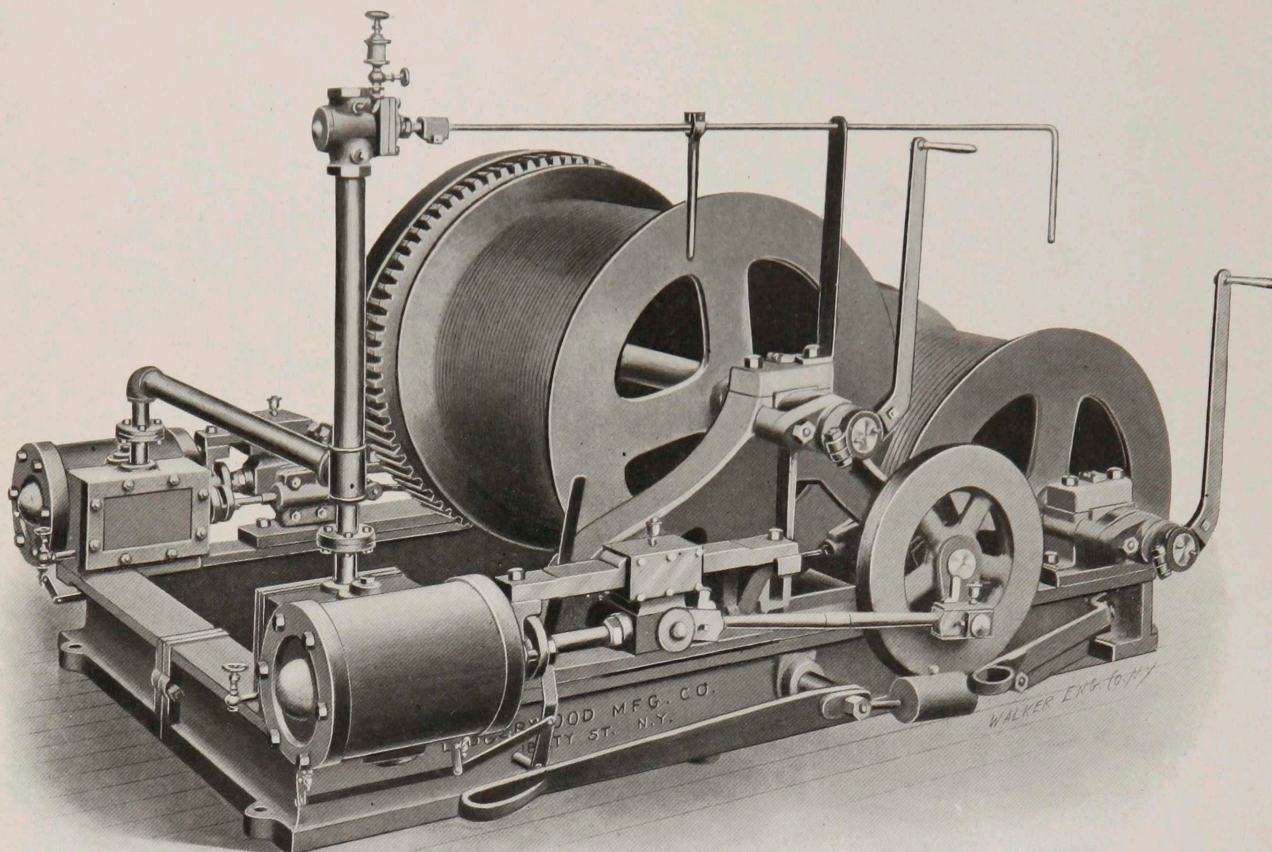
The Harris-Miller Patent Inclined Cableway

THE above engraving gives a sectional elevation of the Harris-Miller Inclined Cableway, which is adapted for slate quarries where the load is to be moved between two fixed points. This style of cableway is evidently more limited in its scope than the horizontal type, as it is necessary for it to be inclined at a considerable angle—although nothing like as much as with the old style inclined cableway called the “Blondin”—in order that the resistance to traveling up the incline shall be greater than the strain in the hoisting ropes, as otherwise the load would not hoist. At the lower part of the incline, on account of the peculiar form of the catenary curve taken by the cable it is necessary to provide some means for holding the carriage in place, in order that the load may be lifted when the resistance to travel up the cable is less than the strain in the hoisting rope, and this is provided for in the above cableway by an automatic hook connected with a fixed stop on the cable; and in order to hold the carriage in place at the top of the incline another automatic hook is provided.

In operation, therefore, the carriage travels down the cable by force of gravity until it reaches the hook, with which it at once engages, at the same time automatically releasing the fall-block, which then descends to the ground where the skip or chain sling with the load is attached. The load is then hoisted until it reaches the carriage, when the arm on the fall-block enters the carriage and is hooked fast, at the same time releasing the hook connected with the fixed stop and permitting the carriage to travel up the incline. On reaching the top the carriage engages with the fixed hook there and at the same time the arm of the fall-block is released, permitting the load to be lowered. The fall-block is then hoisted to the carriage and the arm entering same is locked fast while the fixed hook which holds the carriage is released by means of a hand rope. For the class of work for which this style of cableway is adapted it gives the utmost satisfaction and performs its work in the most excellent manner. The fixed stops can be changed from time to time, as necessary, by moving them upon the cable. There are many advantages in this form of inclined cableway. It is simple in operation and comparatively low in price; it works much more rapidly and economically than the old-fashioned style called the “Blondin,” and on a much less angle—and this is an important point, since the greater the angle the more power is required to haul the carriage up the incline. The “A” frames are of the simplest form, and the minimum amount of cable and rope is required. The fall-rope is supported by the Miller patent carrier. A speed of 300 to 500 feet per minut is attained on these cableways.

The **Miller Inclined Cableway** not illustrated, employs two ropes—one for hoisting and one attached to carriage, serving to hold same when at head and at foot of incline. A double friction drum is employed. The angle of incline must not be less than twenty-three degrees.

The engine used is shown on succeeding page.



Inclined Cable Hoisting Engine

With Double Cylinders and Patent Double Friction Drums and Brakes

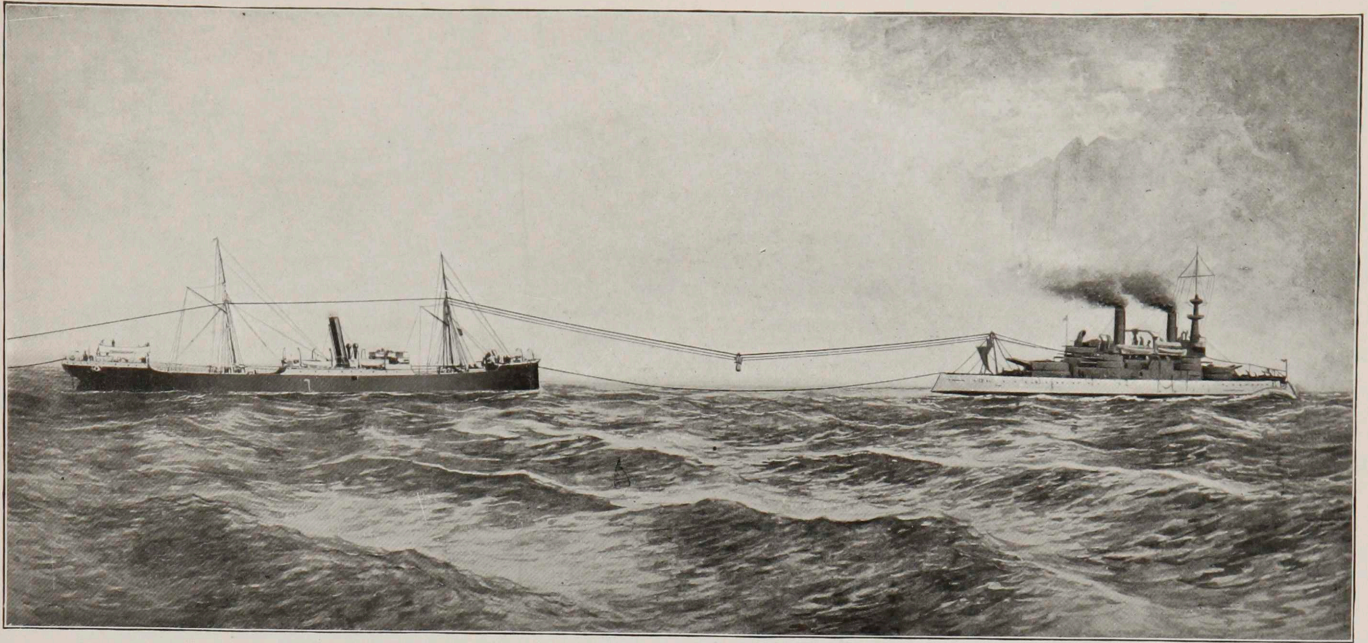
THE above engraving represents a special form of hoisting engine, designed for operating two inclined Harris-Miller cableways or an inclined cableway and a derrick. The engine has double cylinders $8\frac{1}{4}$ inches diameter and 10 inches stroke, and as the cranks are connected at an angle of 90 degrees, has no centres, runs smoothly, and is always ready to start.

The drums are of our improved patent friction type, and are both 34 inches diameter and 26 inches face, and are spirally grooved to suit the size of rope used, or can be smooth if so ordered. They are geared in the proportion of 5 to 1, thus giving rapid hoisting speed, and with the single block, as shown in engraving of carriage on preceding page, have a hoisting capacity of three tons.

When the forward drum is used for derrick work, it is usually made 24 inches diameter in order to reduce the speed and increase the hoisting capacity. Each drum has a powerful band foot brake. The cylinder drainage cocks are connected by rods, and are all opened and closed simultaneously by means of a small lever convenient to the engineer. The steam pipe is connected from one cylinder to the other, but the exhaust is arranged to be connected independently with each cylinder, and can be connected with the top or bottom of the cylinders as may be most convenient. A **winch head** is fitted on the outer end of each drum shaft, and can be used for hoisting and dragging stones, etc.

Engine Number 151. Shipping Weight, 8,500 lbs. Price, all complete, \$

If a **Single Drum** Engine is desired, we recommend the No. 120 engine, geared in the proportion of 5 to 1. (The engraving of No. 120 engine shows it with the 3 to 1 gearing.) See page 56.

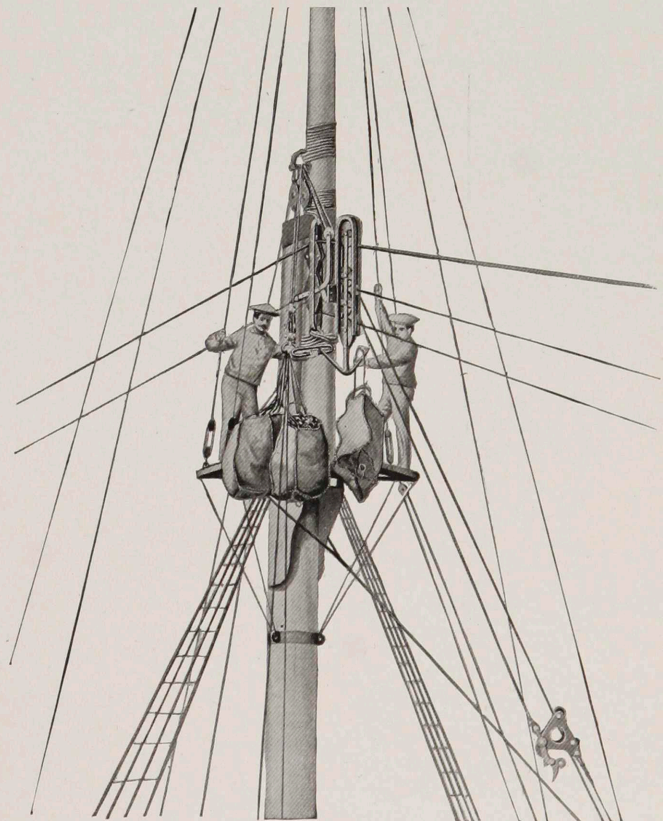


* Lidgerwood-Miller Marine Cableway

For Coaling Ships at Sea

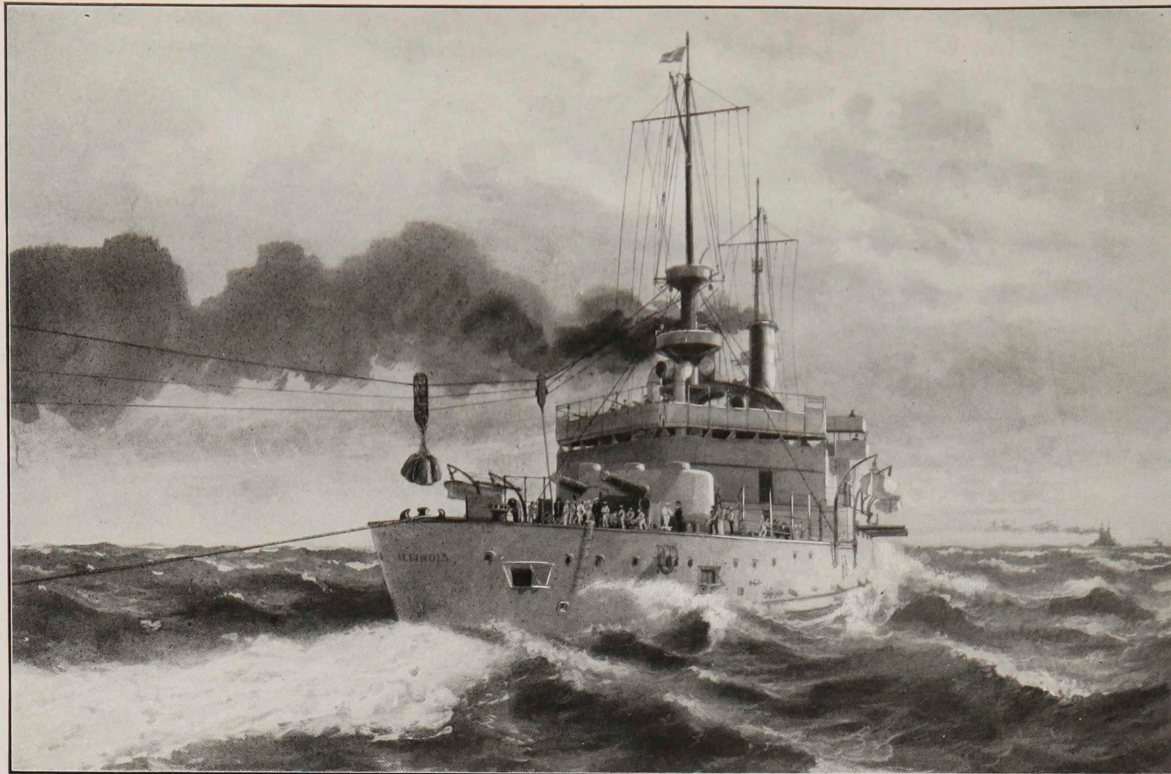
ONE of the most unusual and striking developments of the cableway system of handling material has been its application in special form for coaling battleships at sea. The problem of coaling war vessels in a seaway has occupied the attention of the navies of the world for many years, but no successful method has hitherto been found, and it remained for our Cableway Department to develop a system which at once accomplished the desired purpose. The first Marine Cableway was installed on the United States collier "Marcellus," under a guarantee to safely transfer from collier to warship 15 tons of coal per hour in 400-pound bags, in a moderate sea. On being tried in a sea somewhat heavier than contemplated it was entirely successful in transferring from 20 to 24 tons per hour, taking two bags per trip. The towing speed was 5 to 6 knots per hour.

The second Marine Cableway was equipped upon the British collier "Muriel." It has had several sea trials and has delivered from 35 to 40 tons per hour in a moderate sea and a half gale of wind to H. M. S. "Trafalgar." The battleship towed the collier at speeds varying from eight to eleven knots per hour. The same collier has also coaled H. M. S. "Empress of India" at sea at the same rate.



MAST HEAD OF COLLIER—TRANSFERRING LOAD FROM ELEVATING TRUCKS TO CABLEWAY CARRIAGE

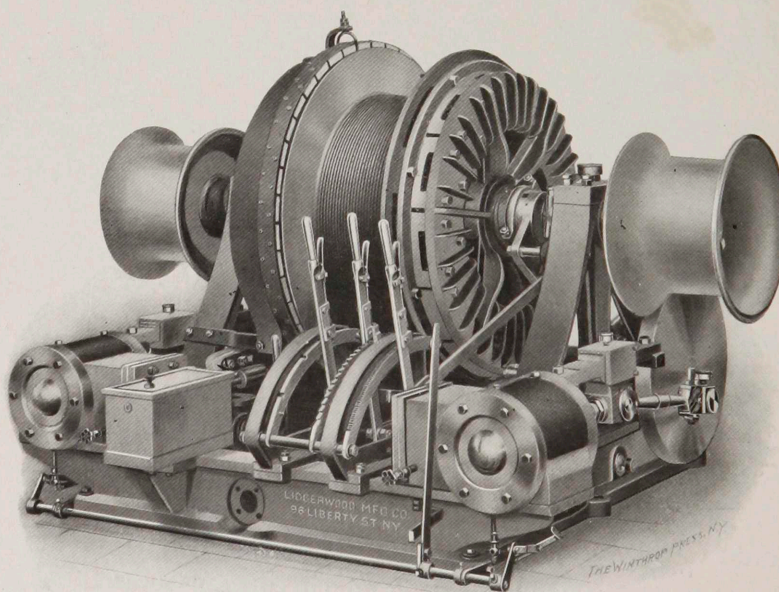
* Patented by SPENCER MILLER, C. E.
in United States and Europe.



The U. S. S. "Illinois" Taking Coal at Sea, Using the Lidgerwood-Miller Marine Cableway

IN the third installation, on board the United States Battleship "Illinois," a departure from the previous plan was made by placing the operating machinery *on board the warship*. The advantage of this arrangement is evident in that it permits the battleship to take coal or supplies at sea from any captured vessel having masts. The cableway winches were made so as to replace the winches originally furnished by us for the "Illinois," and shown on page 98, so that the present winches serve the double purpose of operating the Marine Cableway as well as performing their regular duty as superstructure winches, without occupying additional space.

In harbor coaling the Winch Heads are used and will hoist 2,240 pounds at a speed of 300 feet per minute. The slipping drum will lift a load of one-half ton and develops a rope speed of about 1,700 feet per minute. There are two of these winches used—one for drawing the loaded carriage towards the warship, and the other for drawing the empty carriage back.

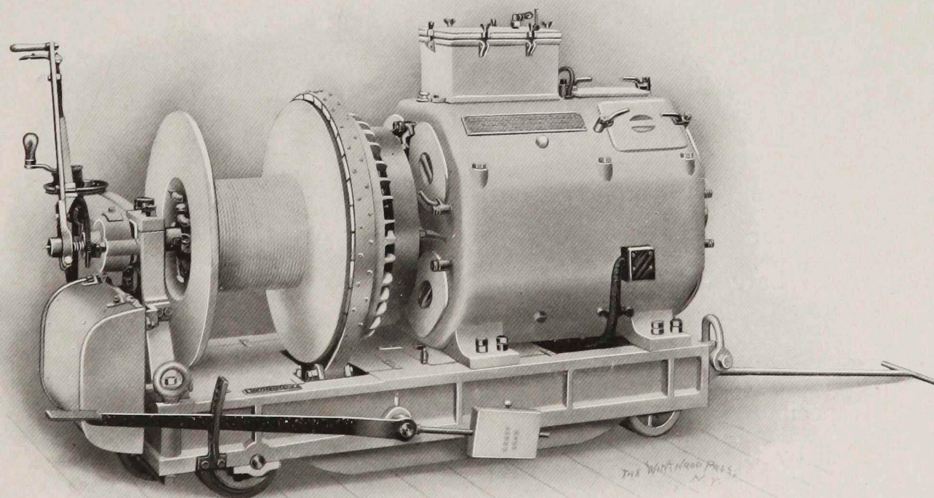


MARINE CABLEWAY SUPERSTRUCTURE WINCHES. CYLINDERS, 8 1-4 IN. X 8 IN.; DRUM, 30 IN. DIAMETER, 13 1-4 IN. FACE; WINCH HEADS, 14 IN. DIAMETER, 16 IN. FACE



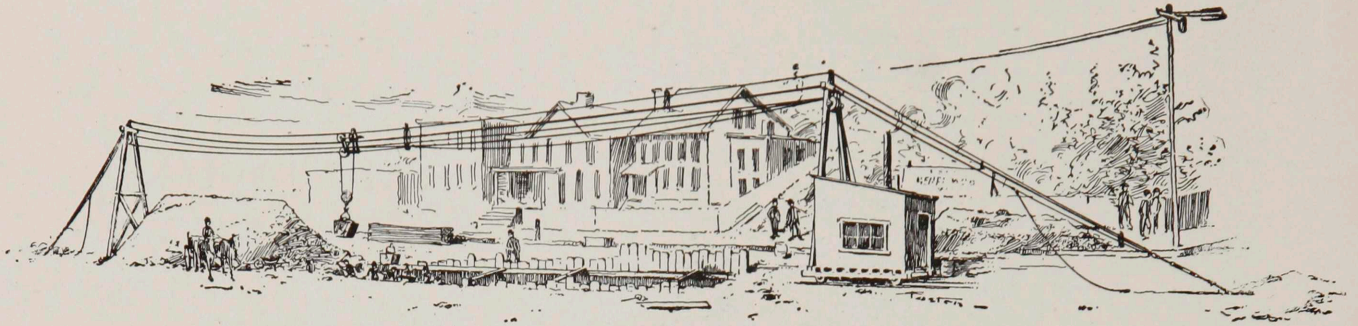
The Imperial Russian Battleship "Retvizan" Taking Coal at Sea from a Collier in Tow

THE fourth installation of the marine cableway, on the Russian battleship "Retvizan," while similar to that of the "Illinois" in general, is operated electrically. Special electric hoists were designed (of which two are used) having drums 14 inches diameter and giving a rope speed of 1,200 feet per minute at full load and 2,000 feet per minute at half load. They are operated by C. B. 24 General Electric Company motors, specially designed to meet the requirements of the Russian Navy. These hoists are mounted on rubber tired wheels, so that they can be moved about the ship at will. No winch heads are used on these hoists as shown on the "Illinois" winches, as the harbor coaling is done by the Lidgerwood Electric Winch, described on page 122.



ELECTRIC WINCHES FOR OPERATING THE MARINE CABLEWAY UPON THE "RETVIZAN"

Send for Cableway Catalogue and Coaling at Sea



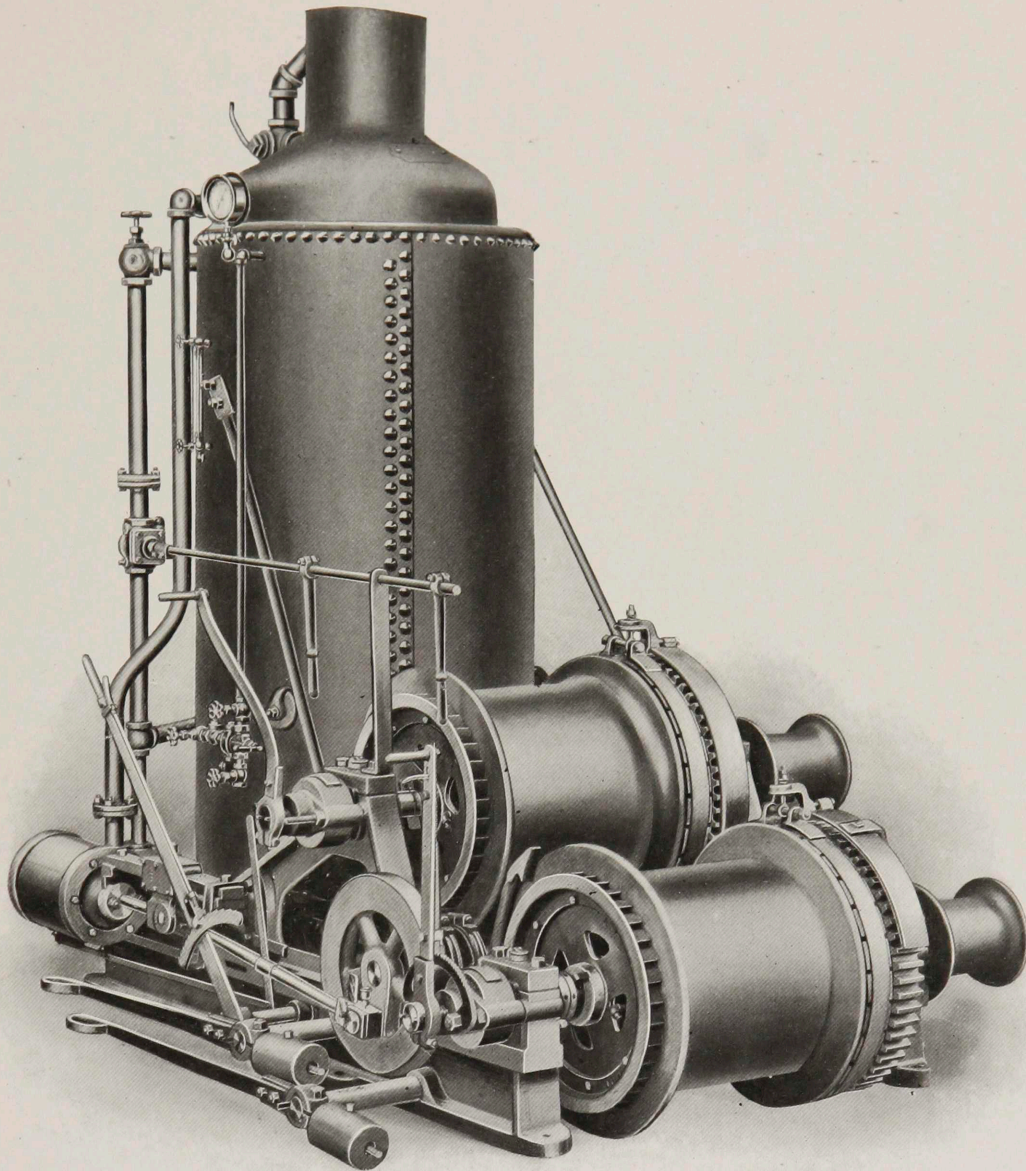
Semi-Portable Cableway

Patents of Locke, Miller & North

Especially designed for Sewer and Trench Excavation—225 to 300 Foot Span

THE problem of rapid and economical trench excavation has been solved by the above portable cableway. Large numbers of these cableways have been erected and are now in successful operation, hoisting and conveying the material and back-filling the trench or sewer. It has many advantages for this class of work over any framed structure, for being of comparatively long span, 225 to 300 feet, it has to be moved less frequently, and being especially designed in all its parts for this class of work, the towers, cables, etc., are light and easily moved. The whole apparatus can be taken down, moved ahead and erected in a few hours with very little expense. For large sewers or trenches, where there is occasionally some rock excavation, it is invaluable, as it does not have to be moved while the blasting is going on, and it is ready for work the moment the blast has been fired. It does not in any way obstruct the trench, and as it is supported entirely at the ends, exerts no pressure on the side banks of the trench. Everything is in the air out of the way, and therefore, enables work on the trench to go on at any point. It is especially convenient for city work where streets have to be crossed, as it does not obstruct the travel. The bucket can be hoisted, conveyed and lowered, or dumped at any point on the cable and the operation is entirely under the control of the engineer, who has a clear view of the whole work. The buckets hold usually $\frac{1}{2}$ to 1 yard or carry in rock about a ton. Every cableway erected has been entirely adequate for any demand upon it, having handled with a single bucket the material as fast as it could be excavated. Large numbers of these cableways are in use in the construction of the **New York Subway**.

These sewer cableways are sold by the **Carson Trench Machine Company**, of BOSTON, under our patents and by a special arrangement, as they are specialists in sewer excavating machinery. They will be furnished and erected by them in running order in any part of the country.



Special Double Friction Drum Engine

Adapted for operating the
Semi-Portable Cableway

THE above engine was designed exclusively for operating the Semi-Portable Cableway described on the opposite page. It has double cylinders, $8\frac{1}{4}$ inches diameter, and 10 inches stroke; double patent friction drums, 22 inches diameter and 26 inches face, with band foot brakes and ratchets and pawls. The engine is of our regular reversible link motion type, which is necessary in the operation of the upper drum, it being curved or spool shaped to carry the endless rope. A special collar is provided for holding the upper friction drum firmly in gear with the friction. The forward friction drum lever is arranged with a thumb-latch and notched quadrant. The reverse lever also has thumb-latch and quadrant. The whole machine is thoroughly well made and intended for severe high speed work.



The New Improved Lidgerwood '99 Cypress Skidder
With Skidding and Hoisting Engines Mounted on Steel Car
Especially Designed for Rapid Logging Operations in Southern Cypress
 (Patents of Beekman, Miller, Dickinson & Baptist)

OUR latest type of Cypress Skidder is the result of over ten years' experience, and has become the standard machine of its class. The apparatus shown in the above engraving and those on the opposite page, consists of a main cable suspended from two trees about 750 feet apart, upon which the skidding carriage travels, also a short cable used for loading the logs, which is attached to a third tree or stump. The carriage supports a hoisting rope, to the end of which are attached a pair of tongs for grappling the logs. It is moved outward by means of an outhaul rope, as shown.

In operation, the tongs are fixed to the ends of one or more logs. The logs are then hoisted well into the air, the hoisting rope is drawn in, the outhaul rope paid out, and the logs are thereby dragged or skidded to the end of the cableway and deposited ready for loading. The outhaul rope then draws out the carriage and hoisting rope to any desired place on the main cable and the tongs are lowered to attach to other logs.

The loading cable spans the railroad track, and a block is secured thereto directly over the track. It carries the loading line, to the end of which is fastened a pair of tongs. The tongs being attached to a log, it is dragged from under the main cable up to the car, and then hoisted clear and landed on the car. The operations of loading and skidding are carried on at the same time. *The loading engine is provided with two drums, which experience has shown to be essential for efficiency.*

The skidding engines are mounted upon Steel Car. This Steel Car has swivelling running gear, so that it can be brought in on the regular track, then jacked up, the trucks turned at right angles and moved sideways on temporary tracks to its position.

The main cable is made fast by a block and fall tackle to a convenient tree or stump on one side of the railroad track; passes up through a block, which is secured to the "head" tree, and then spans about 750 feet, where it is made fast to the "tail" tree. While one cable is in operation, the second main cable is to be put in readiness for use as soon as all the logs near the first cable are skidded.

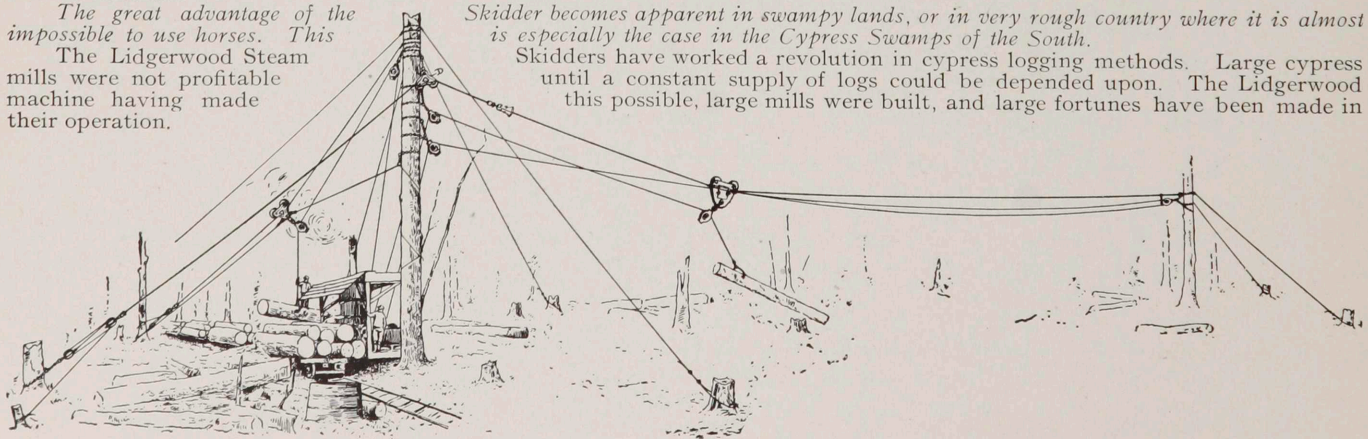
It requires about eight to ten minutes to drop main cable, detach and attach second main cable, draw up and get ready for a fresh start.

The great advantage of the impossible to use horses. This

The Lidgerwood Steam mills were not profitable machine having made their operation.

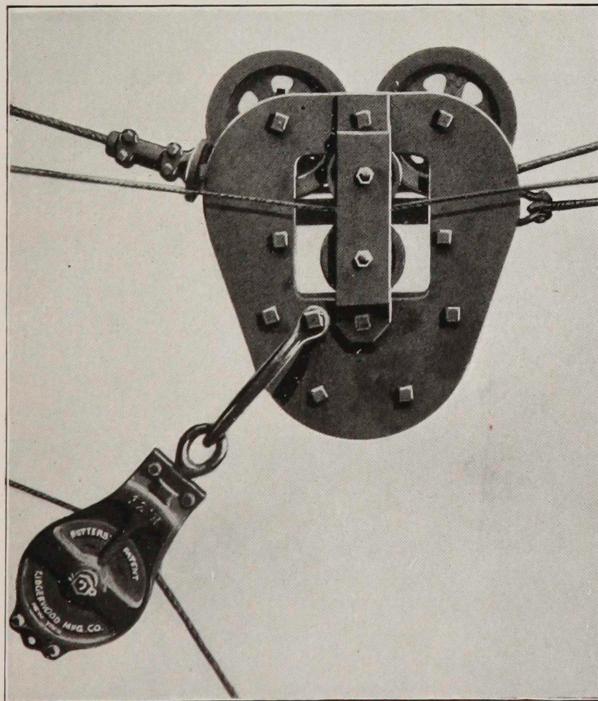
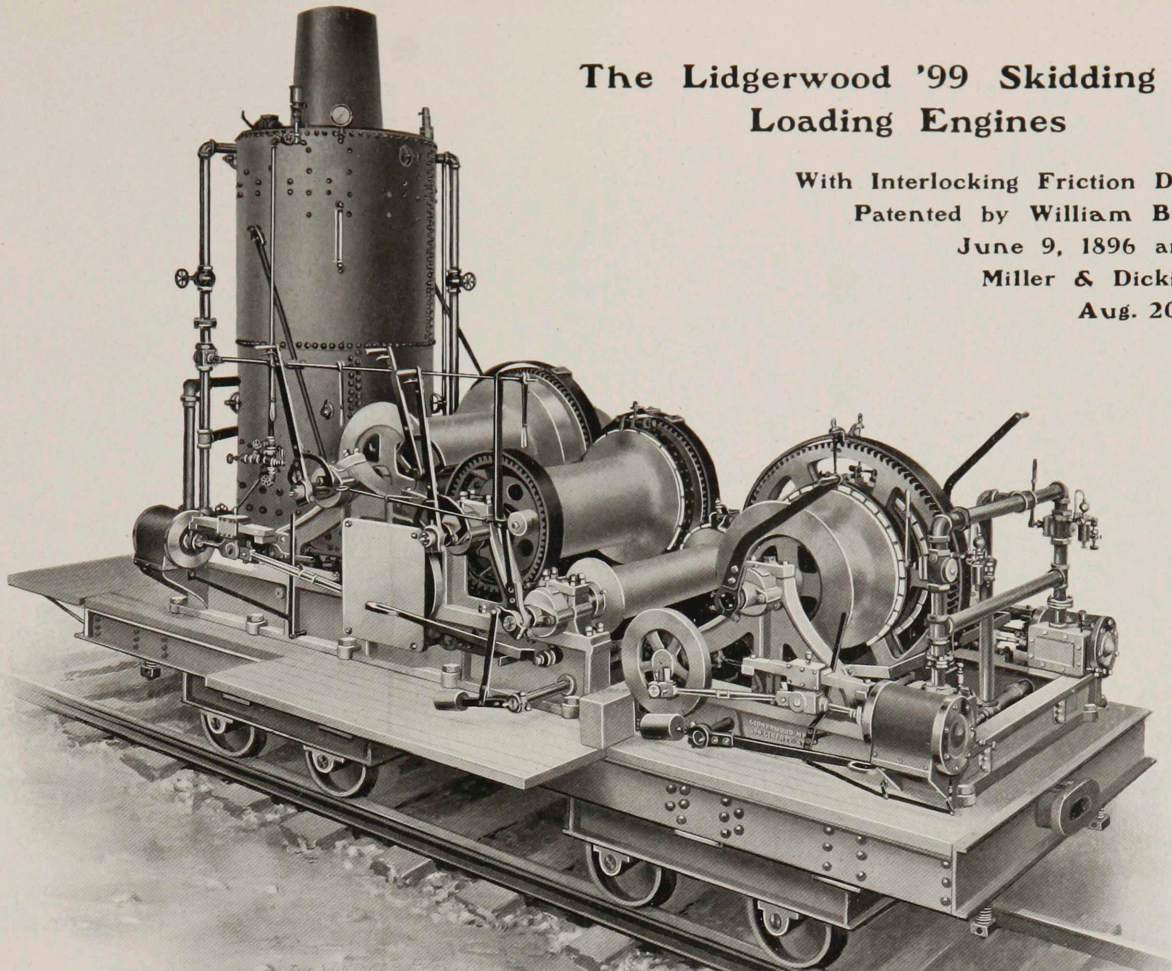
Skidder becomes apparent in swampy lands, or in very rough country where it is almost is especially the case in the Cypress Swamps of the South.

Skidders have worked a revolution in cypress logging methods. Large cypress until a constant supply of logs could be depended upon. The Lidgerwood this possible, large mills were built, and large fortunes have been made in



The Lidgerwood '99 Skidding and Loading Engines

With Interlocking Friction Drums,
Patented by William Baptist,
June 9, 1896 and by
Miller & Dickinson,
Aug. 20, 1901



SKIDDING CARRIAGE

THE present style of Skidding and loading Engines for the Cypress Skidder is the outcome of over ten years' experience. The standard skidding engine, as furnished with this outfit, has double cylinders 10 inch x 12 inch and special friction drums. The entire engine is heavily and substantially built, with most improved frictions and brakes, and all gears of cast steel of a heavy pattern.

The boiler is 56 inches diameter by 118 inches high, of the upright tubular type, cone top, wood burning, with submerged tubes.

The loading engine has 9 x 10 cylinders and is provided with two independent friction drums, each having suitable friction and brake levers.

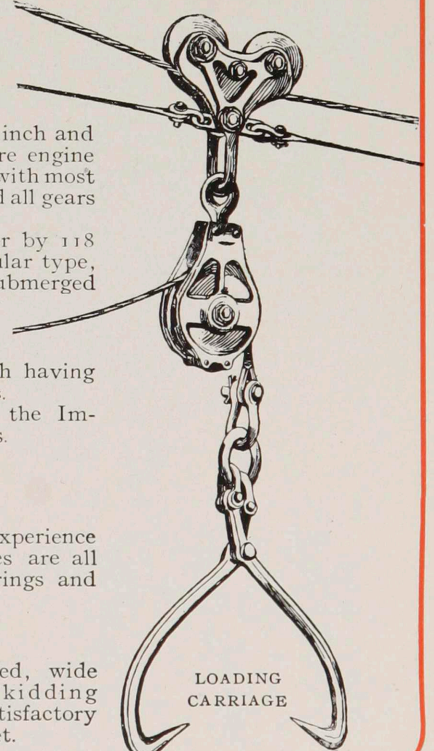
All drums are provided with the Improved Beekman patent frictions.

The Skidding and Loading Carriages

have been perfected by a long experience in actual operation. The sheaves are all of cast steel with superior bearings and oiling facilities.

Blocks

The Lidgerwood steel sheaved, wide bearing, self-oiling patented Skidding Blocks are the only safe and satisfactory blocks for logging on the market.



LOADING CARRIAGE



The Lidgerwood Portable Pine Logger and Loader

Especially Designed for Logging and Loading Pine and for Rapid Movement of Skidding Operations in Pine Forests

(Fully Protected by Patents)

THE peculiar necessities of lumbering operations in the pine forests of the Southern States have resulted in our producing many different forms of logging machines, one of the most popular of which is our special Portable Pine Logger and Loader combined. This Logger is a self-contained machine, heavily and substantially built, and arranged to be carried on an ordinary flat-car to its position in the woods.

Upon arriving at the point in the woods where logging operations are to be commenced, the Pine Logger is jacked up on blocks laid upon the ties at each side of the track, by means of four special high speed ball-bearing jacks, so designed as to lift the Pine Logger clear of its car in about a minute. The carrying car is then run down towards the end of the track and the Logger lowered upon permanent blocking at each side of the track, thus leaving the trackway clear for the passage of ordinary logging cars, empty, underneath the platform and between supporting legs of the logger.

The machine is provided with two booms, one high boom, known as the pulling boom and arranged to carry at its top either two or four pulling lines, which are taken out into the woods and used on each side of the track in any direction to pull in the logs as they are cut, anywhere within a radius of 1,000 feet. This pulling boom is provided with a set of guys so arranged that they can be run out and attached to trees and set up to the proper tension with the least possible delay.

The lower boom is used for loading the logs which have been brought in by the lines from the pulling boom. This loading boom may be made sufficiently long to load logs 70 or 80 feet in length. The heels of the boom are attached to a turn-table provided with a special loading and swinging engine. The boom itself is swung by means of guy lines passing from the swinging drums of the engine through sheaves on the end of the boom to trees. The operation of this swinging and loading boom is entirely independent of the pulling boom, and, therefore, each boom may be used to its full capacity simultaneously. The respective engines are independent in operation and handled by separate operators. In operation, a train of empty cars is backed through the machine, and the logs are rapidly loaded on the first car of the train, which is left under the loading boom. The entire train of cars is moved forward one car at a time by a special drum on the main engine, therefore the attendance of a locomotive is not required except to take cars away to the mill after the entire train is loaded.

The main engine has double 10 x 12 cylinders and a 53 in. x 114 in. upright, submerged tube, cone top boiler, arranged for burning wood and provided with all fittings and injectors, and also provided with spark arrester on the smoke-stack. The boiler is also large enough to provide steam for the loading engine. This main logging engine is provided with four drums, two for the pulling lines, one for spotting the cars, or moving the train along the track, and one for raising and lowering the pulling boom.

The loading engine has double 8½ x 10 cylinders and three special friction drums, one for loading the logs and the other two for swinging the boom. This engine, together with loading boom, is mounted on a steel turn-table and the turning arrangements are novel and exceedingly efficient in their operation.

All gears on both engines are made of cast steel, and all of our latest improvements, as applied to logging engines, are embodied.

Our Pine Logger and Loader, as described above, has proven a phenomenal success from the installation of the very first machine, which worked from the very start without the slightest change of any parts or the least repair. It has been the most phenomenally successful appliance ever built for a logging operation, and although it has been on the market for only about two years we have furnished over a dozen, and they are all in most successful operation, making the most astonishing records in daily capacity.

The great advantage of the machine, aside from its large capacity, is that it does not require any switches and no alterations whatever in the main line of the track. It can be moved from one location in the woods to another, involving the detaching of the guys, lowering and raising of the machine, with a total delay in pulling and loading logs of only about thirty minutes.



End View of Pine Logger and Loader Waiting for Cars

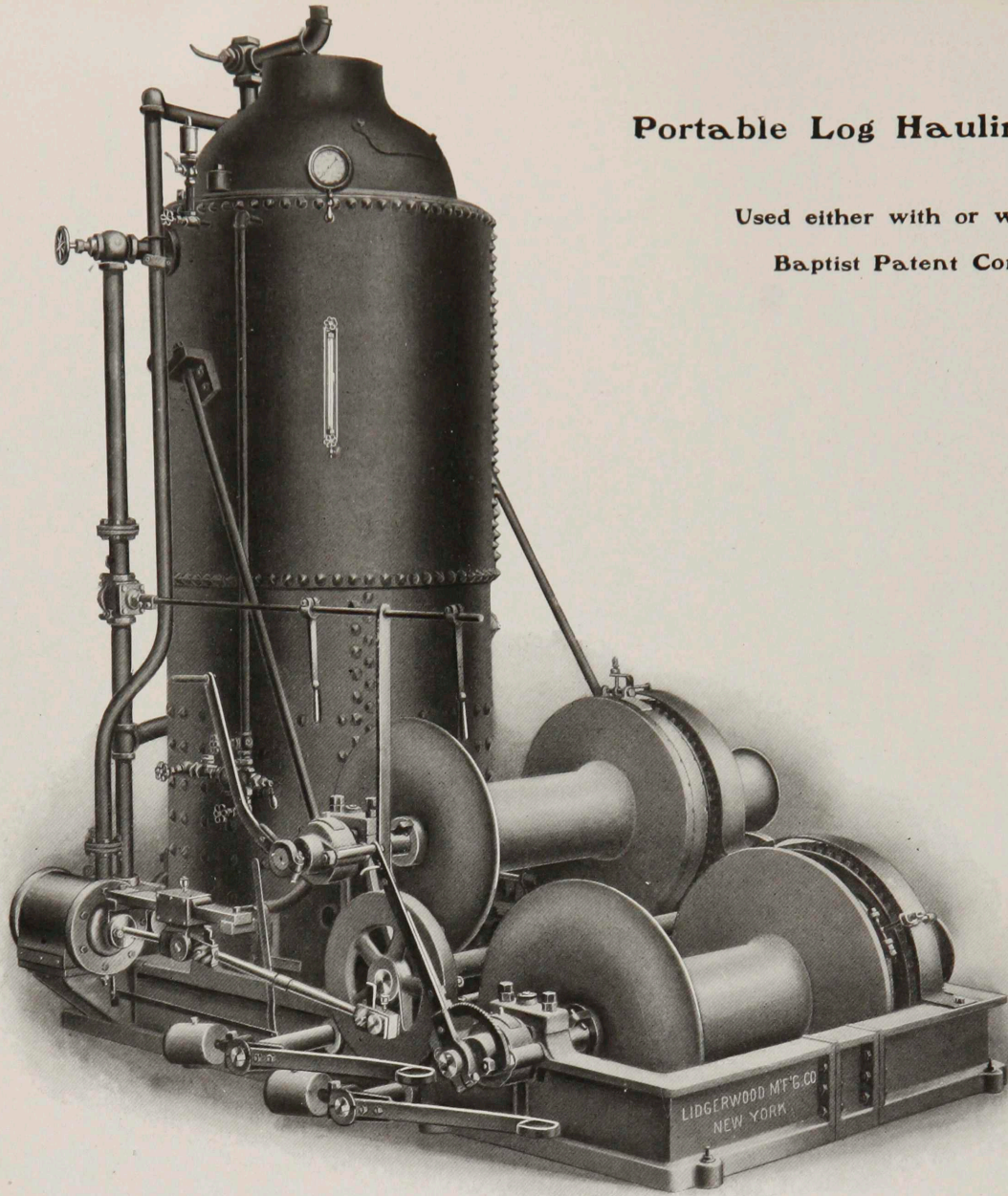
Special Logging Machinery

WE have furnished several hundred special logging plants and all of them have been especially designed for a particular situation. It would be impossible in this catalogue to give any general description of these many different styles of logging outfits. However, we have several expert engineers who devote their entire time to the logging trade, and they are prepared to write fully regarding any proposed plant, or if desired, to visit any logging field in connection with inquiries.

In Preparation—Special Catalogue—Logging by Steam

Portable Log Hauling Engine

Used either with or without
Baptist Patent Cones



WE have made a great many engines for the purpose of hauling logs, especially for the trade along the Pacific Slope, where they are generally used without the Baptist Cones, but operated much faster and more economically with them, and from the experience so gained we have perfected the above hauling engine, which answers the most exacting requirements.

This engine is built in one size, **No. 605**, shown in the above engraving, and has double 9 x 10 cylinders. The crank wheels are set at an angle of 90 degrees. The gearing is made solid and heavy, the driving pinion being of cast-steel and the driven wheels cast-steel also. This engine has two of our Beekman patent friction drums, the diameter being 10 inches in the barrel and the length between the flanges 35 inches. The flanges on the front drum are 36 inches diameter. This drum is designed for hauling in the logs, and is geared to give great power, and will hold 3,000 feet $\frac{3}{4}$ -inch rope. The rear drum pulls the log-hauling rope back into the woods, and is geared for higher speed. Its flanges are 32 inches in diameter. The drum flanges are of special form and thickness to give ample strength when drum is piled full of rope. The boiler is 45 inches in diameter, 108 inches high, is especially designed for burning wood, and has a high furnace and crown sheet. **No. 605, Special**, is THE SAME AS ABOVE in all respects, except that drums are 16 inches diameter.

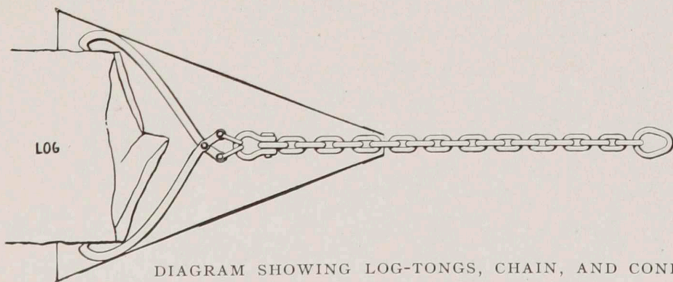
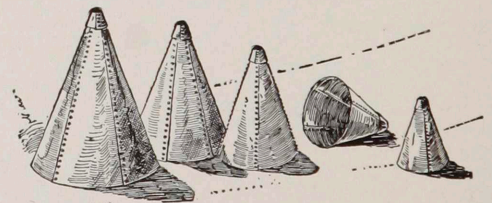
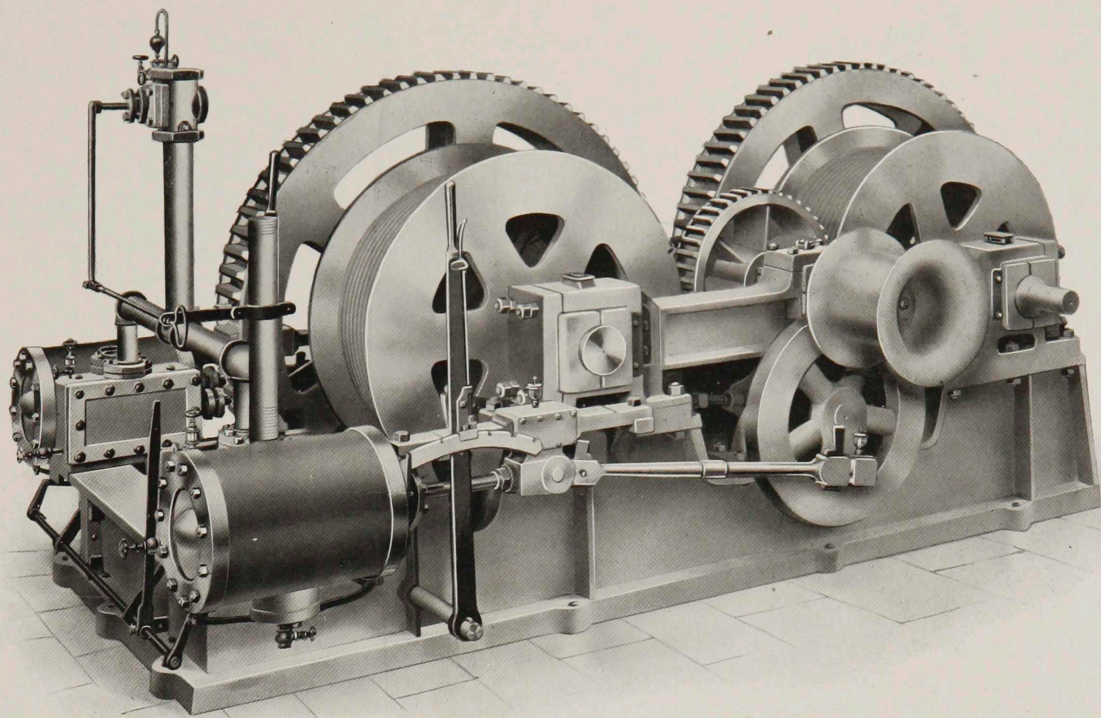


DIAGRAM SHOWING LOG-TONGS, CHAIN, AND CONE



THE BAPTIST CONES (PATENTED)



Log Hauling on Surface of Ground by "Pull Boats"

Baptist System (Patented)

IN the cypress swamps of Louisiana the Baptist system of hauling logs has become popular. This system involves the use of a powerful double drum winding or pulling engine, employing a steel cable about 1 inch in diameter, rigged on the endless rope plan with a sheave secured in the woods 3,000 feet from the engine. To this cable is attached a chain and tongs, and over the same the **Baptist patent steel cone** as illustrated on opposite page. A second cable, about $\frac{3}{4}$ -inch, 3,000 feet long, is employed, connecting the ends of the pulling cable. When one log is being pulled in by one strand of the endless cable, the other is being drawn out into the woods. These logs travel in at the rate of 500 or 600 feet per minute. **The importance of the cones cannot be overstated;** they are indispensable for rapid work, as they enable the logs to be drawn in without imbedding in the ground or catching against any obstruction; and whole trees, 60 to 80 feet long, are pulled out over stumps, and around trees, and through the mud, until they reach their destination, where they can be cut into logs.

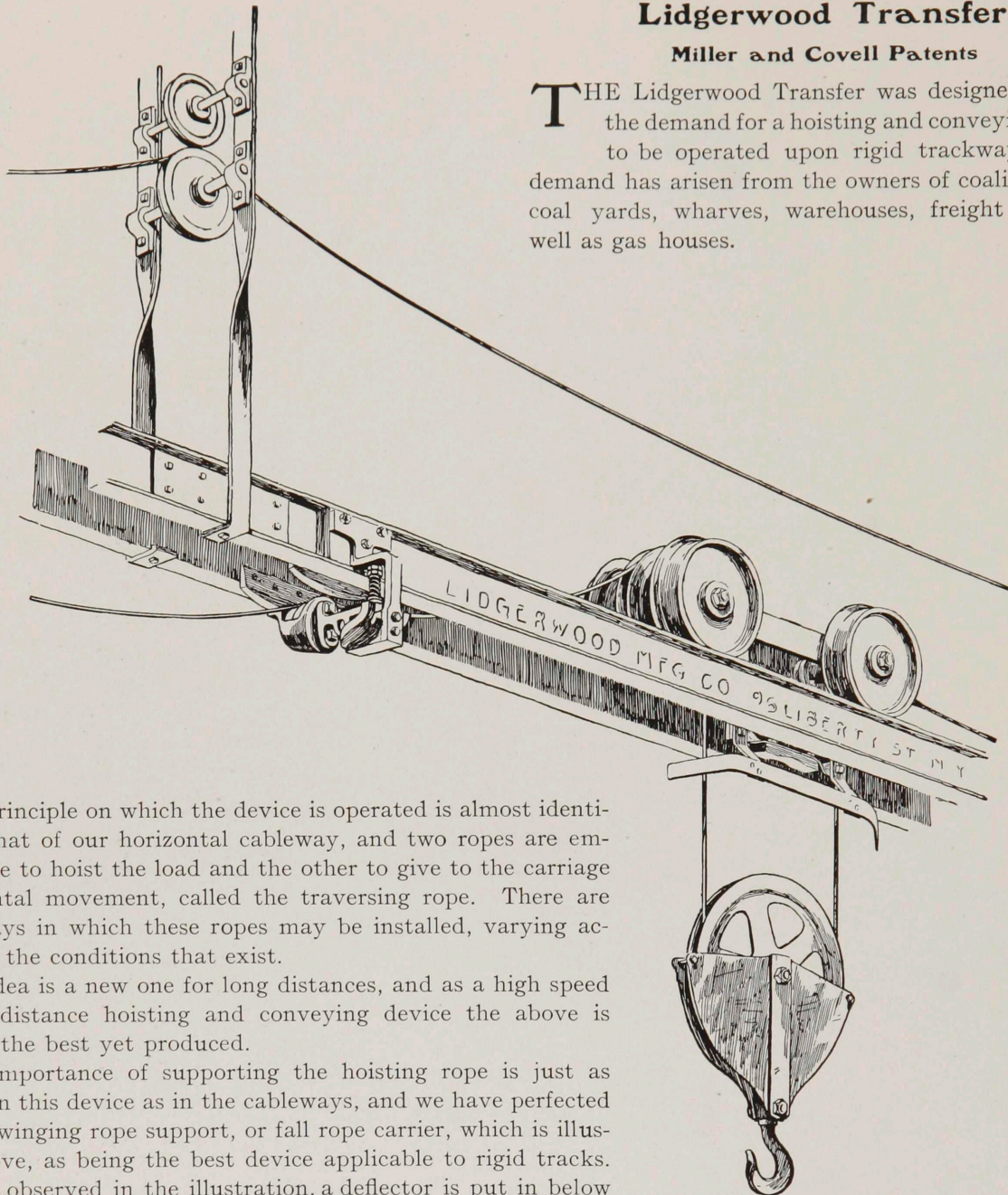
The Lidgerwood Pull Boat Engine

IS built in two sizes, the larger having $12\frac{1}{4}$ x 15-inch double cylinders, with 44-inch diameter drums, and weighs about 33,000 pounds; and the smaller having 10 x 12-inch double cylinders, with 36-inch diameter drums, and weighs about 26,000 pounds.

Lidgerwood Transfer

Miller and Covell Patents

THE Lidgerwood Transfer was designed to meet the demand for a hoisting and conveying device to be operated upon rigid trackways. This demand has arisen from the owners of coaling sheds, coal yards, wharves, warehouses, freight sheds, as well as gas houses.



The principle on which the device is operated is almost identical with that of our horizontal cableway, and two ropes are employed, one to hoist the load and the other to give to the carriage its horizontal movement, called the traversing rope. There are several ways in which these ropes may be installed, varying according to the conditions that exist.

The idea is a new one for long distances, and as a high speed and long distance hoisting and conveying device the above is offered as the best yet produced.

The importance of supporting the hoisting rope is just as apparent in this device as in the cableways, and we have perfected a double swinging rope support, or fall rope carrier, which is illustrated above, as being the best device applicable to rigid tracks. As will be observed in the illustration, a deflector is put in below the carriage. This deflector pushes to one side the fall rope carrier and when the carriage is well past the same it returns to its position, bridging the space between the two trackways.

These carriers should be put in about fifty feet apart for good work, but if the hoisting rope or chain is very heavy they should be used much oftener than that, and on the other hand, when the rope is light, probably to place the carriers every seventy-five feet would be sufficient.

To provide for the possible failure on the part of the carrier to return at once to its normal position after the carriage has passed, the carrier has been made of a special form, so that if the rope should by chance get below the carrier and the same swing back to its normal position, the approach of the carriage will, by the tightening of the rope, open automatically the carrier and thereby lift the rope in its proper position, rendering impossible any accident due to catching under the same.

Surveys and drawings made and estimates furnished for complete apparatus, including engine, carriage, carriers and ropes.

Improved Hod Elevator

Carlson's Patent

**Especially adapted for Hoisting Hods of Brick and Mortar,
and Wheelbarrows**

THE engraving gives a general idea of an Improved Hod Elevator plant which is especially adapted for builders' use.

It is primarily designed for hoisting hods, but is so arranged that it can be used for hoisting wheelbarrows or any kind of material, and can be used in buildings of any height.

The hods are held by a socket on the lower crossbar and by a special form of hook on the upper crossbar. They can be instantly adjusted, and are locked so securely in place that they cannot fall off. The platform is always free and can be used for extra hods or any kind of material. By removing the lower crossbar the platform can be used for wheelbarrows.

By changing a few of the hooks all the hods can be placed on one side, when the shaft happens to be against a wall.

One of the special advantages lies in the anti-friction guide wheels, which not only keep the platform in position but enable it to run up and down with the least possible amount of friction and vibration.

Made in three sizes for four, six and eight hods. The four hod size will take however six hods; the six hod size ten hods and the eight hod size fourteen hods if desired. Send for estimate.

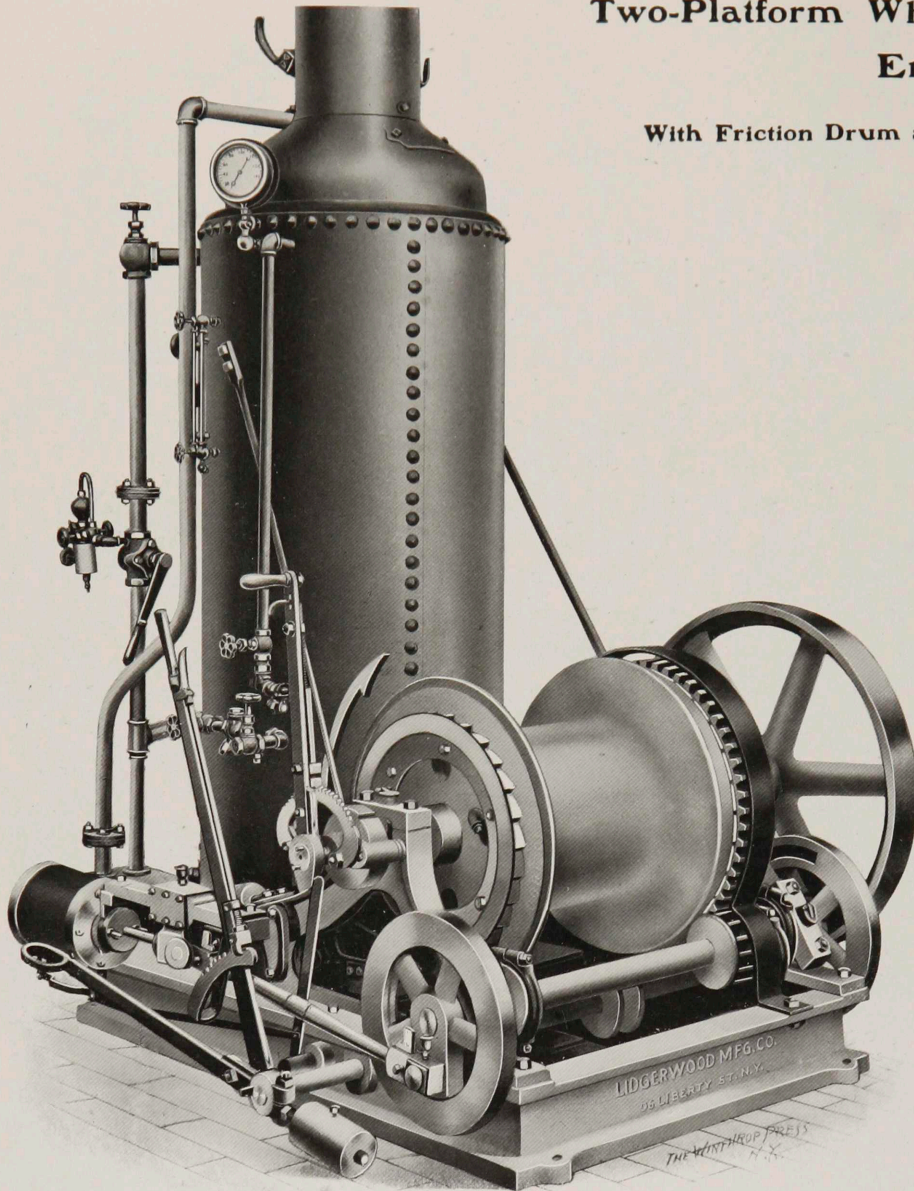
Carlson's Patent Hods are durable, simple and effective.



THIS APPARATUS RECENTLY HOISTED FOUR THOUSAND HODS IN EIGHT HOURS TO THE SEVENTH FLOOR—A HEIGHT OF NINETY FEET.

Two-Platform Wheelbarrow Elevator Engine

With Friction Drum and Reversible Link Motion



THIS engine was especially designed for operating the regular form of double platform elevators for hoisting wheelbarrows or hods in buildings. It has double cylinders, with cranks connected at an angle of 90 degrees, so that it is always ready to start and stop and cannot get caught on the centre. It has reversible link motion, and may be run in either direction by the simple changing of the position of the reverse lever, shown in an inclined position at the left of the engraving. This lever is arranged in a quadrant, so that it remains in whatever notch it is placed by the operator.

The drum is loose on the shaft and provided with the standard double cone wood friction, and is thrown into gear by means of the friction lever, which is also arranged to work on a toothed quadrant attached to the frame of the engine. The friction lever is provided with a thumb-latch and pawl engaging with the teeth of the quadrant, by means of which the friction lever is firmly locked in any desired position.

These interlocking devices on the friction and reverse

levers are of the greatest advantage in the convenience of operation and the prevention of accidents.

The drum is also provided with a powerful differential band brake, operated by a foot lever, by means of which any load the engine will hoist can readily be held; or, if the load is to be held on the drum for any length of time, the drum ratchet and pawl may be used.

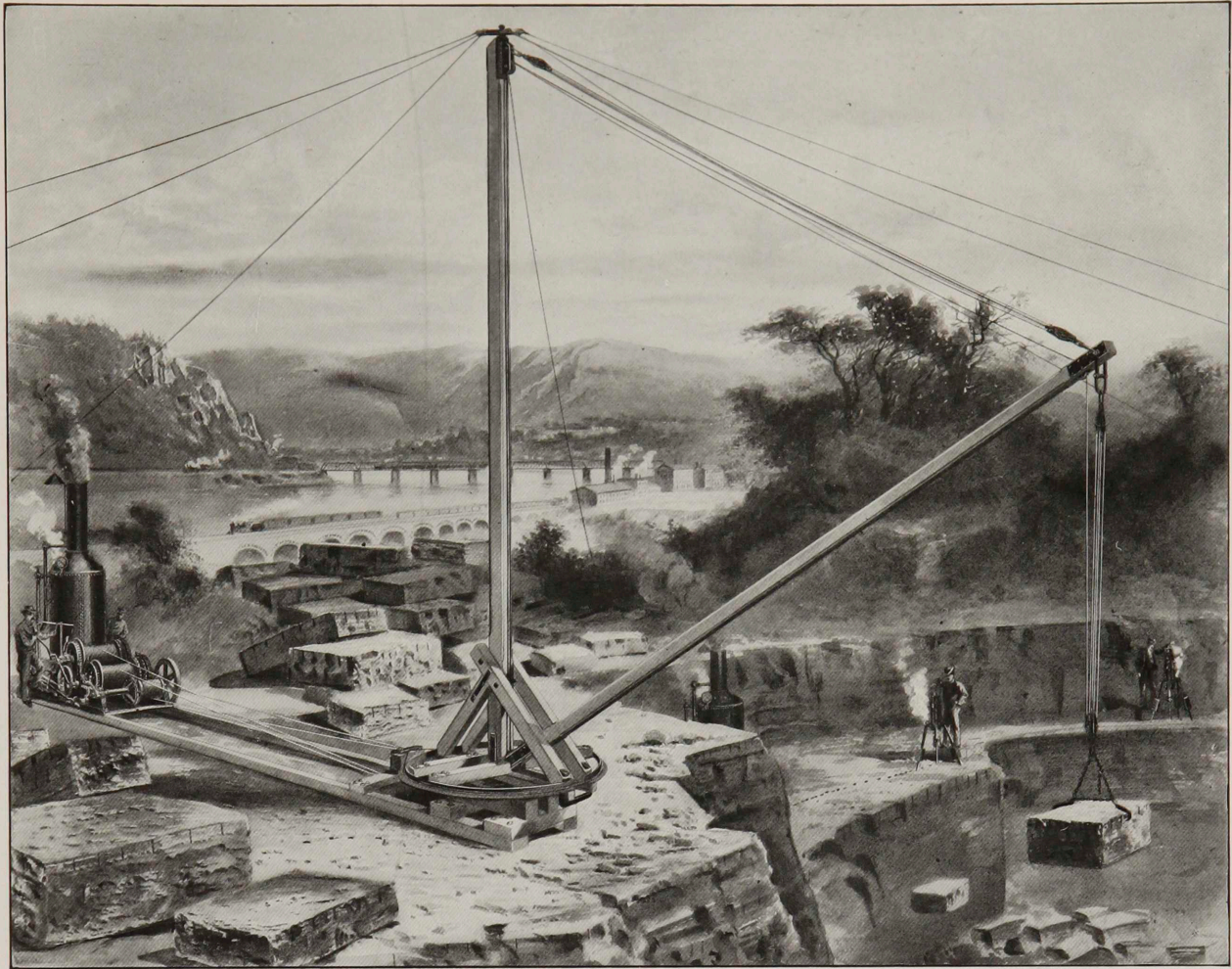
On the outer end of the drum shaft is placed the elevator sheave having a concave surface, around which the hod elevating rope may be passed several times in order to secure sufficient friction to operate the double cages. This sheave is of special shape to perform this duty and is arranged with a clutch on the drum shaft, by means of which it may be thrown out of gear whenever it is desired to use the engine for other purposes.

The drum is, of course, free to be employed in any of the hoisting purposes common to building operations.

In operating the hod elevator the drum is locked into the friction and the engine handled entirely with the throttle, reverse lever, and foot brake. The engine is very quick, and high speeds may be obtained in running the elevator.

TABLE OF SIZES, ETC.

Size Number of Engine	Horse Power Usually Rated	Dimensions of Cylinders		Dimensions of Hoisting Drum		Diameter Tread of Sheave Wheel Inches	Weight Hoisted Single Rope Lbs.	Usual Speed Hoisted Single Rope Feet per Minute	Dimensions of Bed-Plate		Estimated Shipping Weight Lbs.	PRICE Complete with Boiler as per Engraving
		Diameter Inches	Stroke Inches	Diameter Inches	Length Inches				Width Inches	Length Inches		
280	6	5	6	14	18	24	600	350	40	57	3900	
281	8	5	8	16	21	33½	800	500	47	67	5430	



Lidgerwood Standard Guy Derrick

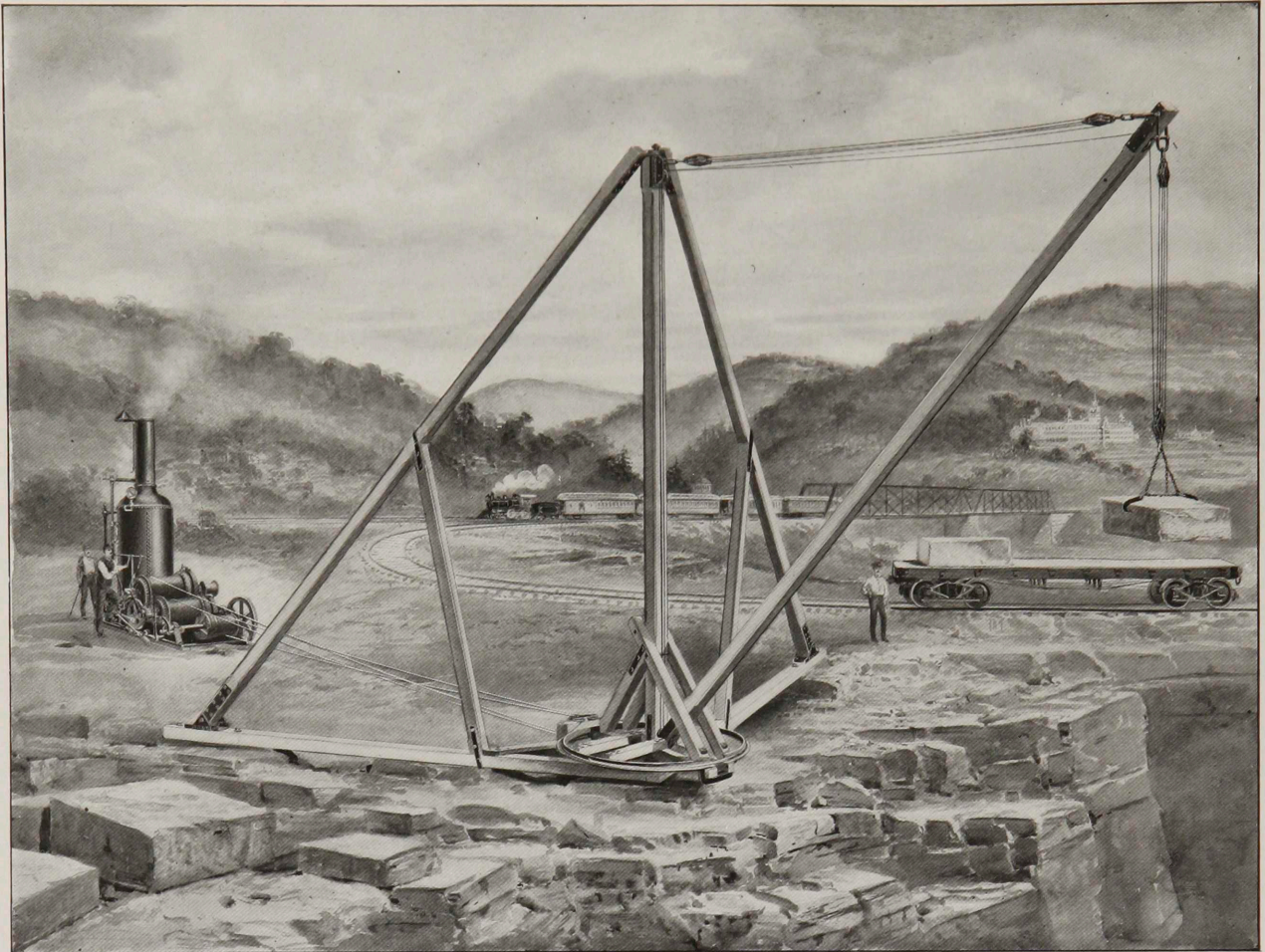
With Bull Wheel and Swinging Gear

(Patented)

THE above engraving illustrates a Lidgerwood Standard Guy Derrick, with Standard Engine shown on page 28.

The principal points of excellence are: 1st. That all parts of the Fittings, except Foot Irons, are made of Wrought Iron Forgings and Structural Steel Shapes—making an *exceptionally strong outfit*. The Spider Plates are of cast steel. 2d. That Foot Block and Mast Step are made with a Universal Joint (Ball and Socket) giving a perfectly free joint, in which friction is reduced to a minimum, and in which uneven setting, or settling of foundation, cause no friction to retard the swinging of boom. 3d. All Blocks are of Diamond Check Pattern. 4th. All Sheaves are fitted with Self Lubricating Bronze Bushings. 5th. Fittings are adapted for either Guy or Stiff Leg Types, being interchangeable by merely substituting Stiff Legs and Goose Necks for Guy Cap. 6th. Framing is reduced to a minimum. 7th. With same set of fittings derrick may be reeved *five* different ways.

Send for Special Catalogue on Derricks



Lidgerwood Standard Stiff Leg Derrick

With Bull Wheel and Swinging Gear

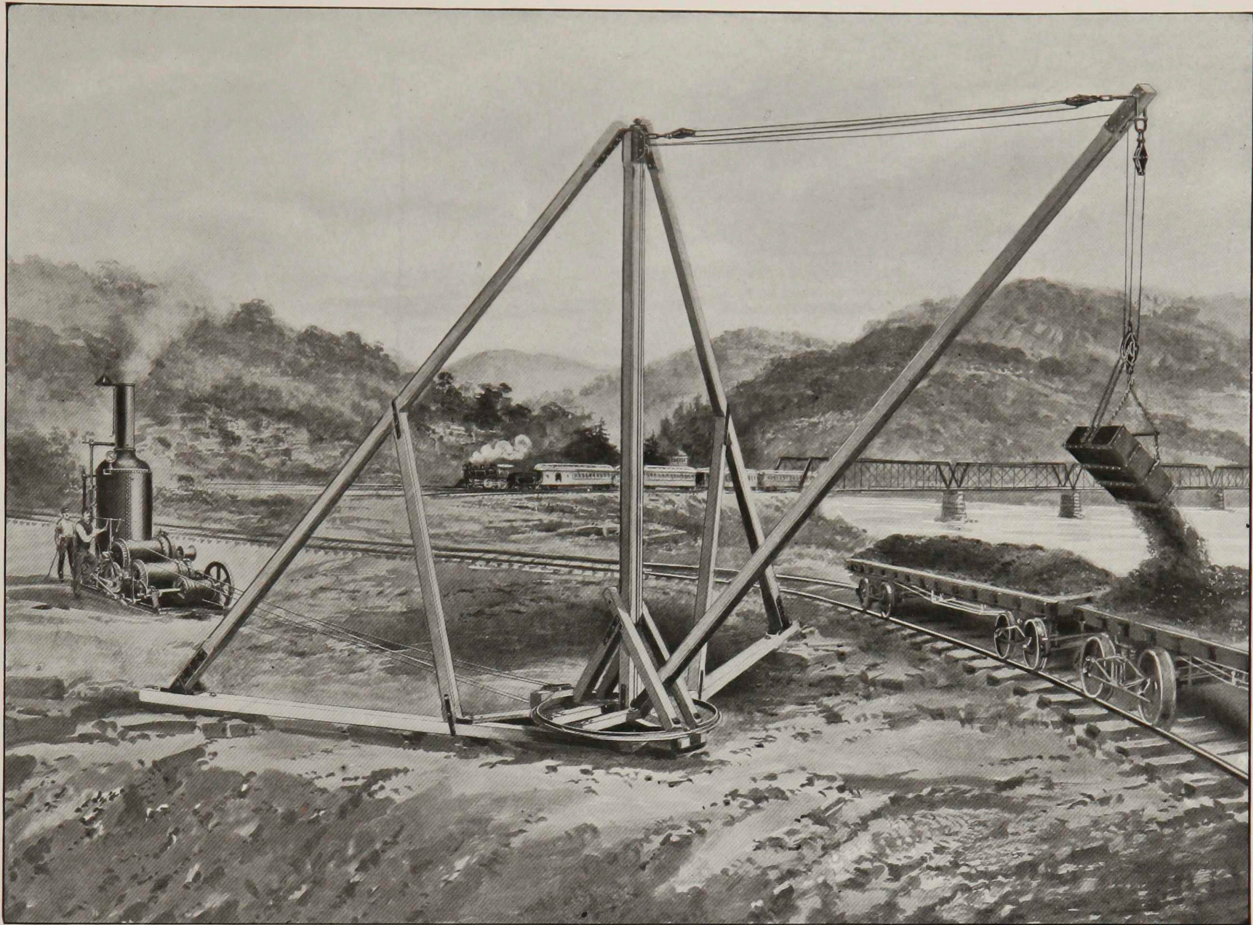
(Patented)

THE above engraving shows our Standard Stiff Leg Derrick, also equipped with regular Double Drum Engine, with Reversible Swinging Gear, shown on page 28. The remarks on opposite page apply equally well to this type of derrick. The ends of the stiff legs are attached to the sills by an extremely simple and effective arrangement. The Goose Necks are of forged iron of extra size and strength, and the Gudgeon Pins are turned.

In general these Derrick Irons are of superior quality and were designed and patented by Edward F. Terry, of the Terry & Tench Construction Co., who is an expert in structural work requiring the use of derricks and hoisting devices of all kinds.

This company has done some of the most important construction work in this vicinity, including the New East River Bridge, etc.

Send for Special Catalogue on Derricks



Patent Dumping Block

With Lidgerwood Standard Stiff Leg Derrick

With Bull Wheel and Swinging Gear



THE "DUMPING BLOCK."

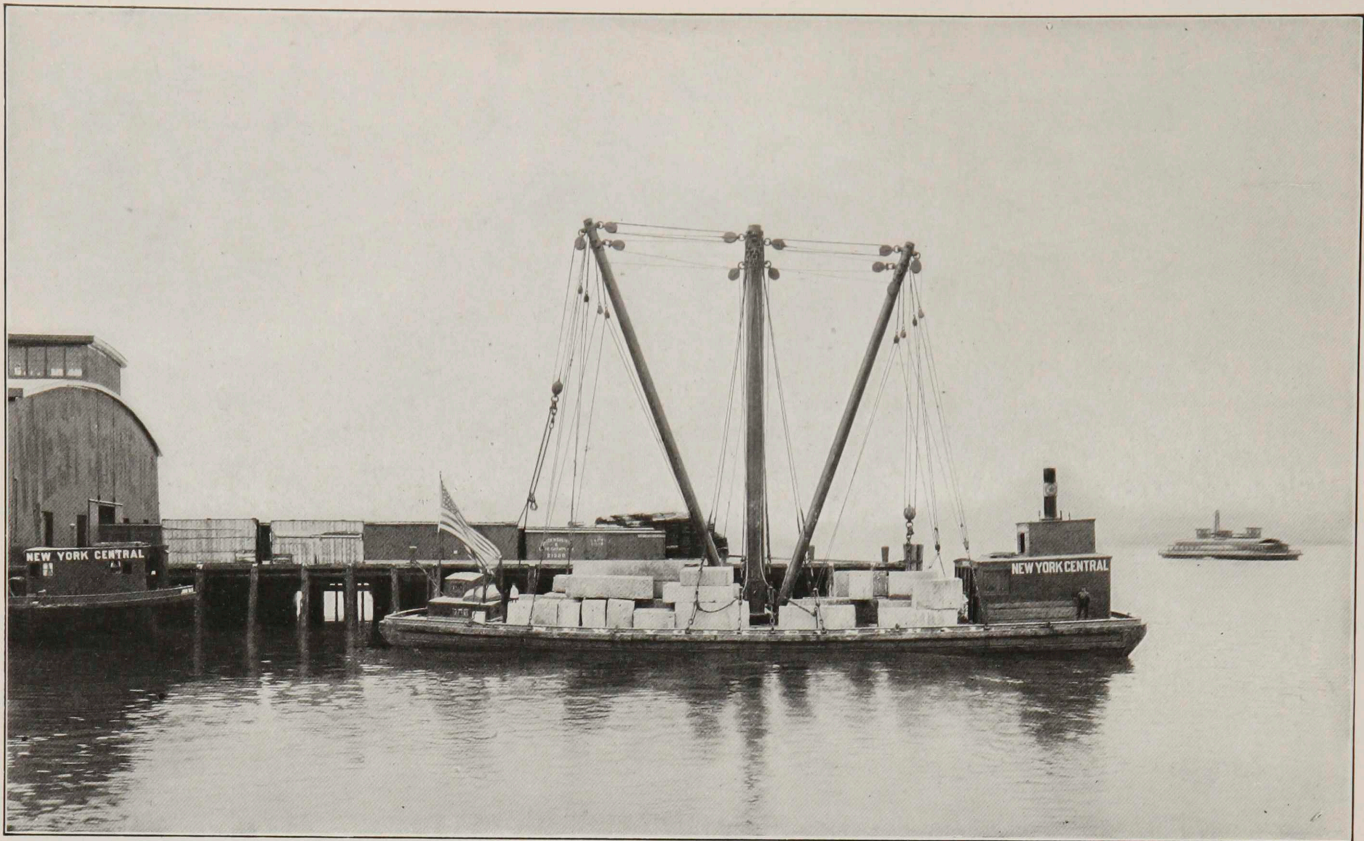
THE illustrations on this page show a Standard Stiff Leg Derrick to which has been added the patented "*Dumping Block.*"

The operation of the Block is as follows: The ropes are reeved through same in the usual manner. The two chains shown on the small chain wheel are secured to the back of skip. A small piece of chain is inserted in the hoisting rope at a point so arranged that when it passes into the block and over main sheave it causes same to revolve. The smaller wheel is keyed to shaft carrying larger wheel. When the latter is turned or revolved by the piece of chain in the hoisting rope passing through it, it causes the chain on the smaller wheel to wind in, and consequently raises the back end of skip, allowing the load to "*Dump.*" Inside of the larger chain wheel there is placed a regular Rope Sheave in which the wire rope passes, until the chain is reached, which causes the Chain Wheel to revolve. The skip is hoisted from the cut or level nearly to height for dumping. The Derrick is then swung around to where load is to be dumped. Then by hoisting load a little more it is dumped as described above.

The Block is a great *labor saving device*—the engineer dumps the skip—thus saving man for unhooking same, as well as time required.

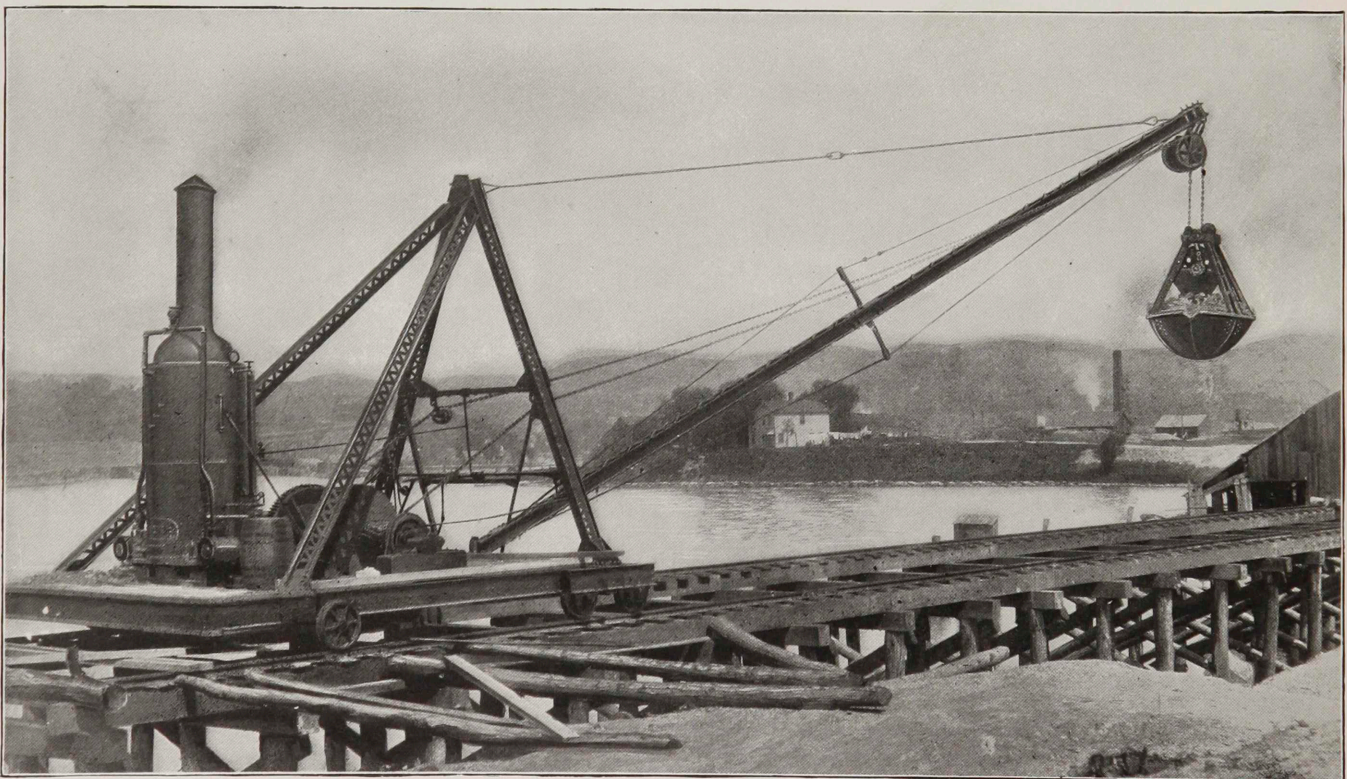
Price of Block Complete, including Chain, \$——.

Send for Special Catalogue on Derricks



Lighters "Powerful" and "Mogul"—N. Y. C. & H. R. R. R.

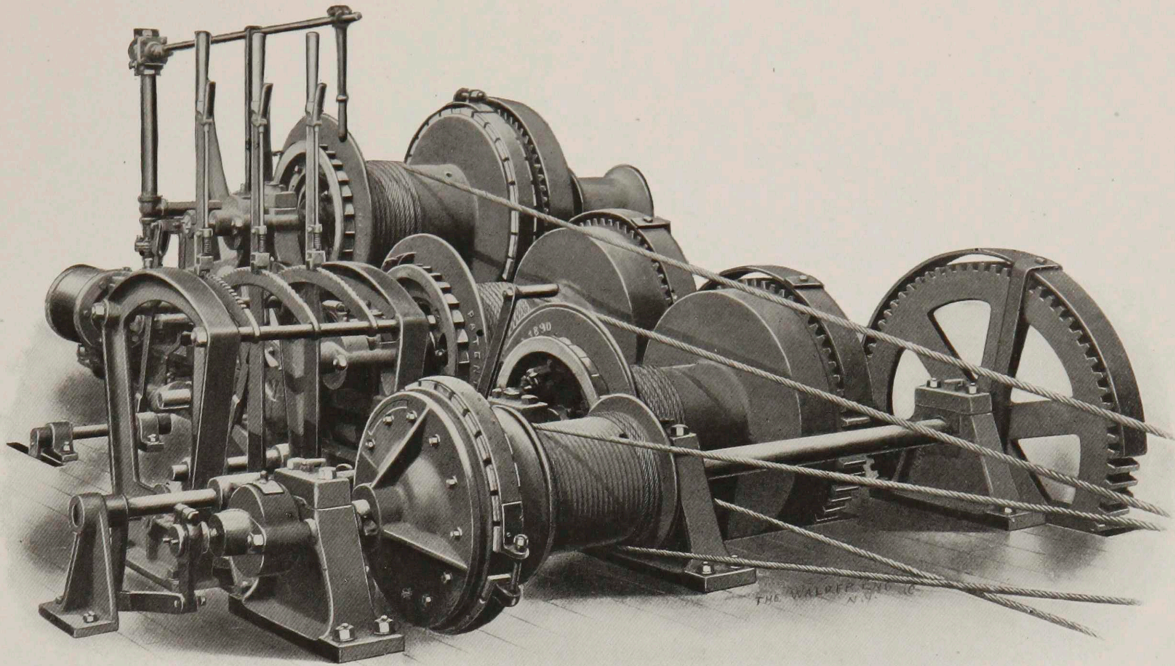
Length of Booms 90 Feet. Capacity of Derricks 45 Tons.
Operated by Special Four Drum Engine and Boiler illustrated and described on page 51.



One Cubic Yard Steel Traveling Derrick

Boom, 45 feet long. Bucket, 1 cubic yard. Hayward "Orange Peel." Gauge, 16 feet 10 inches.

SEND FOR SPECIAL CATALOGUE ON DERRICKS.



Three Drum Tandem Engine

With New Reversible Drum Swinging Gear

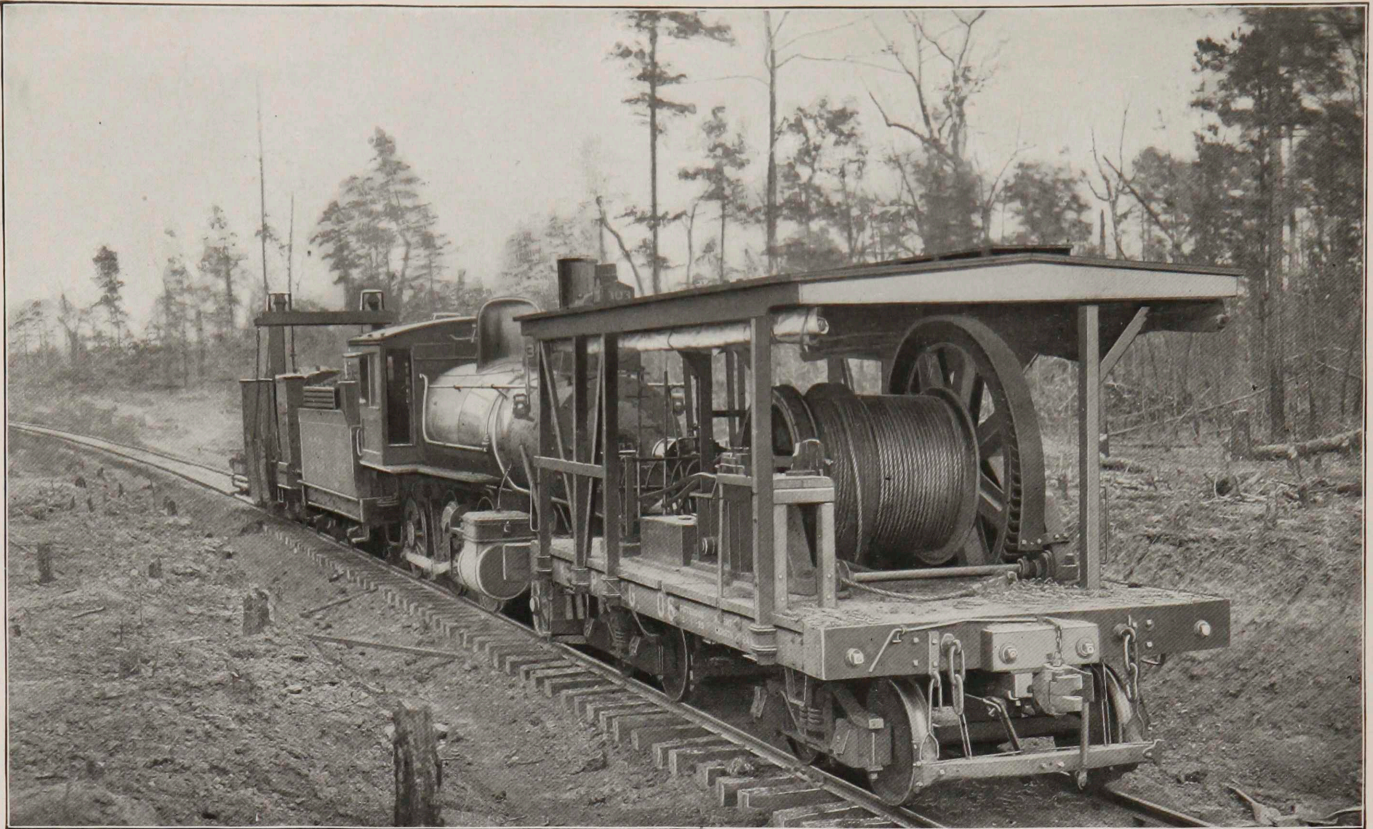
THIS engine is designed for the complete operation of the Hayward Sand Digging Machine, with Boom and Clam Shell Bucket.

It has three tandem friction drums with ratchets and pawls, and the rear drum, only, has a band brake. Three fixed winch heads are furnished. On the forward drum shaft is a pinion connecting with a large gear operating the New Reversible Drum Swinging Gear, the ropes on which connect with a large bull wheel for swinging the boom.

The forward drum hoists and lowers the boom, and the two rear drums open, close and hoist the Clam Shell Bucket.

The regular drum operating levers are all in a rack, and are of our usual thumb-latch type, engaging with notched quadrants. A separate lever is furnished for the swinging drum, which one man operates while a second man operates the other levers. The engine performs the work with the utmost rapidity and economy, and a round trip involving a hoist of 75 feet, including the raising of the boom, and a swing of 150 feet, as well as filling and discharging the bucket, is accomplished easily in 40 seconds. The boom in the case described is 90 feet long, and the bucket one and one-half yards capacity. The bull wheel is 20 feet diameter.

The various sizes of this type engine are given on page 48 and 49.



The Lidgerwood Rapid Unloader

(Patented)

THE system of unloading ballast invented by Drake and Stratton, which consists of pulling the plow by a special engine, instead of by a locomotive, is now so well known and largely used by all the leading railroads of the country that we shall do no more than briefly describe same, referring those interested to our special catalogue of 48 pages, with the above title. The above engraving shows the engine mounted on a flat car, taking steam from the locomotive. The engine, which is now familiarly known in railroad circles as a "Lidgerwood," is a very massive and powerful compound geared hoisting engine.

Its function is to pull the plow along the train of cars, thereby unloading them. The plows may be either centre, or right or left hand. A wooden side plow is shown in the engraving on the opposite page, while a steel centre plow of the largest size is shown on the right of this page.



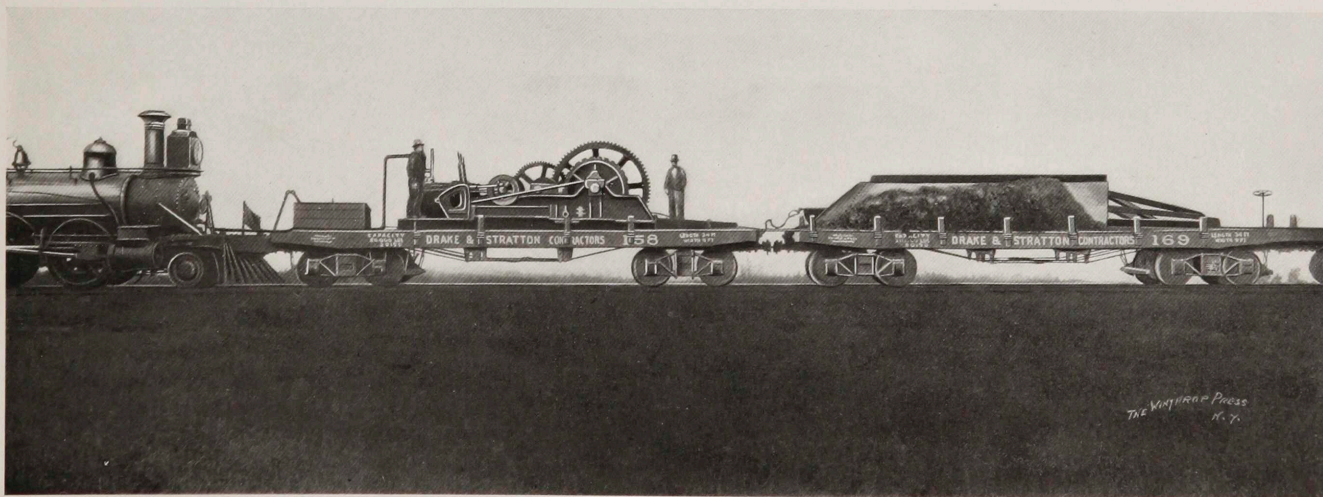
LARGE STEEL CENTRE PLOW AND SPECIAL CAR



In order that the plow may pass from car to car, iron aprons are used to cover the spaces between them. Cars are now made having high swinging sides specially for use with the Unloader. They are of large carrying capacity. The engraving on opposite page shows this car.

The flexibility of this system of unloading is one of its chief merits, for by moving the plow and locomotive in the same direction the ballast can be distributed as thinly as desired, while by backing the locomotive as the plow is drawn forward the distribution may be as thick as required. If the locomotive backs at precisely the same speed that the plow advances it is evident that the entire train can be unloaded at one spot. Thus a wash-out can easily be filled.

SEND FOR SPECIAL CATALOGUE ON THE LIDGERWOOD RAPID UNLOADER



POSITION OF THE LOCOMOTIVE, RAPID UNLOADER AND PLOW AFTER THE TRAIN HAS BEEN UNLOADED

Boilers

General Description

OUR only object in erecting our Boiler Shop was to enable us to furnish, in connection with our Hoisting Engines, a **superior quality** of Boilers, both as regards material and workmanship, such as was found to be impossible to purchase in the open market.

They are built in the best and most thorough manner, and solely with a view of supplying an absolutely safe, reliable and durable boiler, and the workmanship is the finest that can be done.

The Material

is the best we can purchase. The shells are made of steel of first-class quality, stamped 55,000 tensile strength. The tube heads and fire boxes are made of the best flange steel.

The tubes are of extra quality and make, and are thoroughly inspected before being put into the boilers. The rivets are of a superior quality of iron.

The Workmanship

is of extra quality in every detail, and the boilers are built and finished with a care which is not usual in boiler shops. All our boilers are **hydraulic riveted**, which ensures an absolutely true and tightly driven rivet, every rivet being subjected to exactly fifty tons pressure, neither more nor less, thus avoiding the defects of uneven riveting, which occur with every other system of machine and hand riveting.

The superiority of the hydraulic over every other system is universally admitted.

The Bracing and Staying of all our boilers is done in accordance with sound mechanical principles, and is of ample strength, with a large factor of safety.

All edges of sheets are planed off true and smooth, and all seams are thoroughly caulked, **both inside and outside** the boilers, thus ensuring perfectly tight joints and preventing the water in the boiler from penetrating between the seams and corroding and weakening the joints.

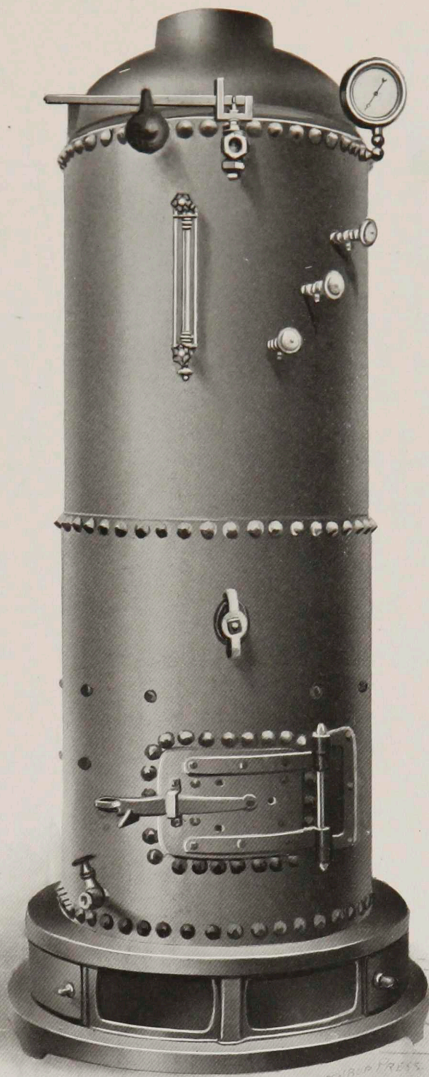
The Tube Heads are flanged on a machine specially made for the purpose, and the tube holes are drilled to exact size and the tubes carefully fitted, being usually driven in with a maul, and then expanded. Tubes thus fitted will stay tight and give no trouble, whereas tubes fitted in loosely—as is usually done, to save time—and then expanded, are continually leaking, and are a constant source of trouble and annoyance.

The Fittings

are complete and of the best design, and are very strong and substantial.

The Tests

are of the most thorough character, and comprise, besides a practical steam test to the guaranteed working pressure of 100 lbs., a hydrostatic test to a pressure of 160 lbs., every boiler being absolutely tight when sent out.



Improved Upright Tubular Boiler

With New Pattern Cast Iron Base and Fixtures Complete

IN designing the above style of boiler we adopted the usual form, but departed from the customary practice which prevails among boiler makers, of crowding the boiler full of tubes, thereby increasing the heating surface and enabling them to be rated at a higher horse power, regardless of the area of the grate surface, or the size of the fire box. In order to determine the maximum efficiency of a boiler of a given size of grate surface we have made a series of careful experiments at our works, increasing and decreasing the number of tubes, and their length, and increasing the size of fire box or combustion chamber, until we have now arrived at the dimensions stated in the following table as embodying the results which actual practice has shown to give the maximum efficiency. While this form of boiler is not the most economical in the use

of fuel, yet, if properly proportioned, and used with natural draught it will give good results; and on account of its low cost and its compact form is particularly desirable where space has to be economized. It is also extremely portable and easily set up and run, and is much used by contractors, builders, quarrymen, etc.

The shell is made of the best steel of 55,000 tensile strength, and the tube heads and fire box are of the best flange steel of same strength. The door, door frame and mountings are all of wrought iron, and made in the strongest and neatest manner. The bottom end of the water leg is flanged ogee shape. The fire box is stay-bolted to the shell, with screw stay-bolts properly riveted over on the ends. The tube heads are drilled, and particular care is taken to have the tubes a tight fit—the tubes then being expanded. Suitable hand holes are provided, both on the line of the lower tube heads and at the bottom of the water leg, for cleaning purposes.

The improved cast iron base is particularly strong and compact. This base is round, with a flange on the bottom with bolt holes for securing to the foundation. The sliding doors are a great convenience, as they are easily opened, stay wherever put, and are not in the way of the fireman.

The hood, or smoke box, is of cast iron, will not easily burn out, and with reasonable care will last as long as the boiler. It is secured to the boiler by two stud bolts and nuts.

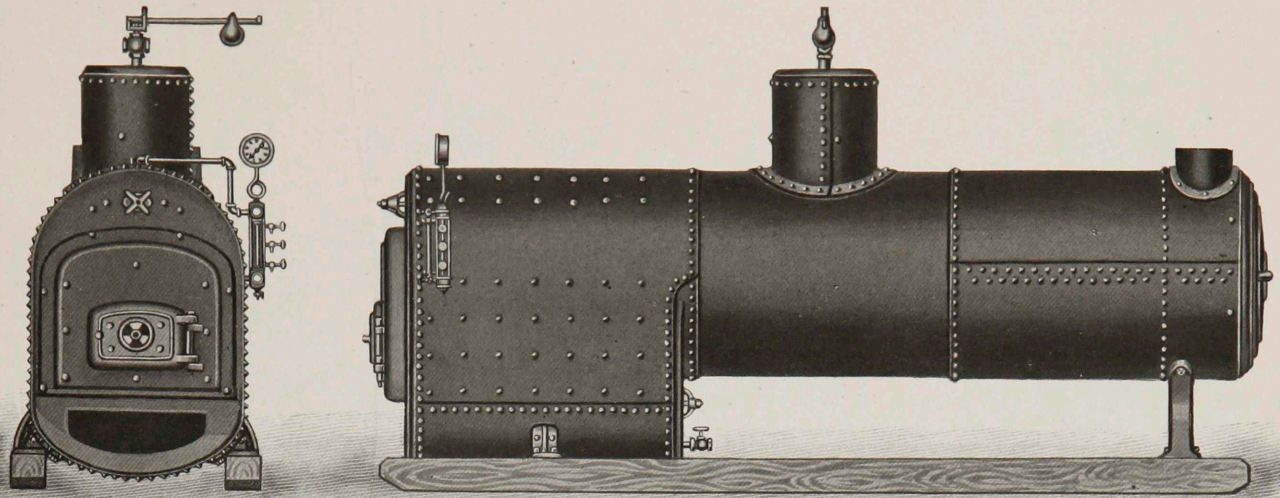
The fixtures comprise the following: Base, hood or smoke box, grates, grate ring, safety valve and nipple, steam gauge with syphon, water gauge, three gauge cocks, check valve and nipple, and blow-off valve and nipple.

TABLE OF SIZES, ETC.

Number	Horse Power	Diameter of Boiler Inches	Height of Boiler Inches	Number Tubes (all 2 inch Diameter)	Length of Tubes Inches	Thickness of Iron in Shell and Furnace Inches	Thickness of Tube Heads Inches	Estimated Weight of Boiler without Fixtures Lbs.	Estimated Weight of Boiler and Fixtures Complete Lbs.	PRICE		
										of Boiler only without Fixtures	of Boiler with all Fixtures Complete as per Cut No Stack	of Boiler with all Fixtures Complete including Inspirator No Stack
1	5½	28	63	40	40	¼	⅜	1075	1550			
2	6½	28	69	40	45	¼	⅜	1150	1675			
3	7½	30	72	44	48	¼	⅜	1400	1950			
4	8½	32	75	48	50	⅜	⅜	1550	2175			
5	10	34	78	52	53	⅜	⅜	1725	2400			
6	11	36	75	57	50	⅝	⅜	1885	2700			
7	12	36	81	57	57	⅝	⅜	2025	2925			
8	13	38	81	68	57	⅝	⅜	2250	3075			
9	15	40	75	80	50	⅝	⅜	2160	3250			
10	17	40	84	80	57	⅝	⅜	2500	3600			
11	21	42	90	88	63	⅝	⅜	2775	3900			
12	29	48	96	115	68	⅞	⅞	3600	5400			
13	31	48	102	115	72	⅞	⅞	3750	5450			
14	35	50	102	124	72	⅞	⅞	4275	5900			
15	40	50	114	124	84	⅞	⅞	4700	6400			
16	40	53	102	150	72	⅞	⅞	5100	6900			
17	50	53	120	150	87	⅞	⅞	5775	7800			
17½	55	60	108	180	75	⅞	⅞	6150	8400			
18	60	60	120	180	87	⅞	⅞	6850	9200			

Smoke Stack is always extra, and is furnished of any length desired at a suitable price.

Larger Sizes and **Special Sizes** made to order, and also **Vertical Cross Flue Boilers** for use with salt water.



Portable Water Bottom Locomotive Boiler

THIS style of Boiler is particularly adapted for all duty requiring a portable Locomotive Boiler, as it is easily moved from place to place, and can be quickly set up ready for work, without trouble or expense.

It steams rapidly and economically, with either coal or wood, and with ordinary care and attention wears well, and is as safe as any style of boiler made.

The front of the furnace is wrought iron bolted to the boiler, and is substantial and durable. The crown sheet, water legs and bottom are thoroughly braced.

The water bottom has suitable hand holes for cleaning purposes, and there is also a hand hole in smoke box below the tubes. A large hand hole is placed in front of boiler for the inspection of crown sheet and bracing.

The domes are of flange steel strongly braced to sides, and are double riveted to shell, except in the first two sizes, which are single riveted.

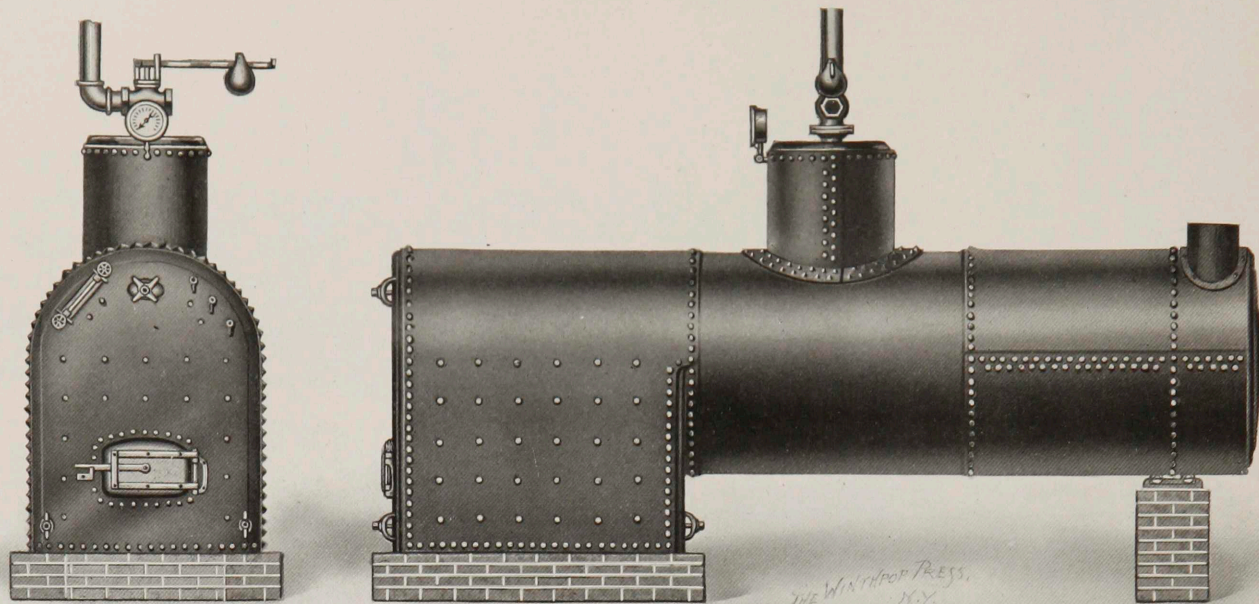
They are all tested by hydrostatic test of 160 lbs. pressure, and guaranteed to be tight and perfect under a working pressure of 100 lbs. of steam.

TABLE OF SIZES, ETC.

No. of Size	Horse Power	Diameter of Boiler Inches	Length of Furnace Inches	Width of Furnace Inches	Thickness of Plate Shell and Furnace Inches	Thickness of Heads Inches	Number of Tubes All 3 Inches	Length of Tubes Inches	Diameter Smoke Stack Inches	Length Smoke Stack Feet	Length Boiler Over All Feet	Weight on Skids Pounds	PRICE with Fixtures on Skids
19	8	28	35	22	$\frac{1}{4}$	$\frac{3}{8}$	20	60	14	15	9	3750	
20	12	32	42	26	$\frac{3}{8}$	$\frac{3}{8}$	26	66	16	20	10	4500	
21	20	36	52	30	$\frac{5}{16}$	$\frac{3}{8}$	33	86	18	25	12	5750	
22	30	40	60	34	$\frac{5}{16}$	$\frac{3}{8}$	40	102	20	30	15	8500	
22 $\frac{1}{2}$	40	42	60	36	$\frac{5}{16}$	$\frac{3}{8}$	42	120	20	35	16 $\frac{1}{2}$	10000	

Fixtures furnished with these boilers comprise grates, smoke stack and guy rods, steam gauge, water gauge, gauge cocks, whistle, safety valve, blow-off valve and check valve.

Inspirators or injectors, or steam boiler feed pumps are extra, and will be supplied and attached, if wanted. Large sizes made to order at same prices as Nos. 34 to 37, on succeeding page.



Stationary Locomotive Boiler

THE above style of Locomotive Boiler is adapted for stationary work in places where it is inconvenient to erect the brick work necessary for a return tubular boiler, or where economy of space has to be considered. It is claimed that they are quite as economical in the use of fuel as boilers set in brick work, and they can be forced much beyond their rated capacity by an increased draught—such as exhaust in stack, steam or power blower, etc. They have large water spaces around the fire box, and the bottom of the water leg and the door frame around door between furnace and outside are wrought iron, and the door is also wrought iron. The crown sheet is strongly braced, as are also the side and end flat surfaces around the fire box. The domes are of flange steel, securely braced to sides, and they are double riveted to the shell. All longitudinal seams are double riveted. The legs have proper cleaning hand holes, and a hand hole is put in back smoke box connection below the tubes. In front, over crown sheet, there is large sized hand hole for the inspection of crown sheet and bracing. Sizes Nos. 32 to 37 have manholes upon top of shell, back of steam dome, for cleaning, repairing, or inspection. They are all tested by hydrostatic test to 160 lbs. pressure, and guaranteed to be tight and perfect under a working pressure of 100 lbs. of steam.

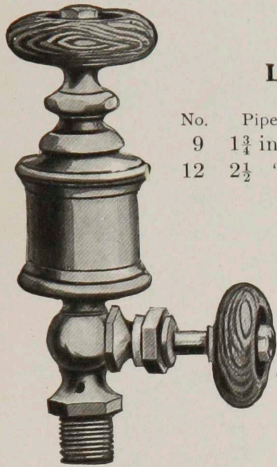
TABLE OF SIZES, ETC.

Number of Size	Horse Power	Diameter of Shell Inches	Width of Front Inches	Length of Furnace Inside Inches	Width of Furnace Inside Inches	Number of Tubes all 3 Inches	Length of Tubes Feet	Diameter of Steam Dome Inches	Height of Dome Inches	Diameter Smoke Stack Inches	Length Smoke Stack Feet	Length Boiler Over all Feet	Thickness of Plate Inches	Estimated Weight of Boiler and Fixtures Lbs.	PRICE of Boilers and Fixtures Complete
30	15	32	32	40	27	26	6½	16	18	14	20	11	9/32	4500	
31	25	36	36	48	31	35	8	18	19	16	25	13	1/8	5500	
32	30	40	40	54	35	40	8½	22	24	18	30	14½	5/16	8000	
33	40	42	42	54	36	42	10	24	26	18	30	16¾	5/16	9500	
34	50	48	48	54	42	54	10½	26	28	22	35	17¼	5/16	10500	
35	60	54	54	60	48	60	11	28	30	24	40	18¼	11/16	13825	
36	80	60	60	60	54	76	12	30	33	26	45	19¼	3/8	16000	
37	100	63	63	60	54	95	13	32	36	28	50	20½	3/8	19250	

Fixtures furnished with these boilers comprise grates, bearer bars, steam gauge, water gauge, gauge cocks, whistle, safety valve, blow-off valve, check and stop valves for feed pipe, smoke stack and guy rods. Smoke stacks have dampers. Inspirators, injectors, or steam boiler feed pump are extra, and will be supplied and attached if wanted.

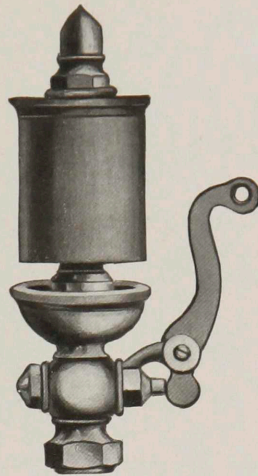
Steam Fittings

Of Superior Quality



Lubricator

No.	Pipe	Thread	Price
9	1 1/4 inch	3/8 inch	\$
12	2 1/2 "	1/2 "	



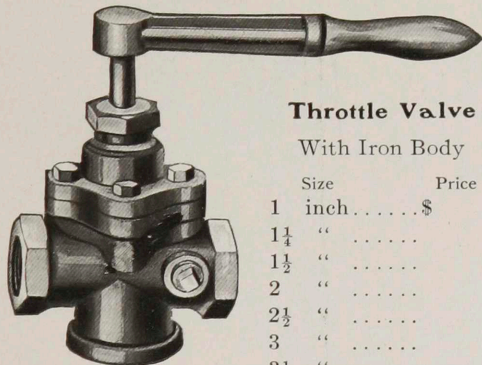
Steam Whistle

Size	Price	Size	Price
2 inch	...	3 1/2 inch	...
2 1/2 "	...	4 "	...
3 "	...		



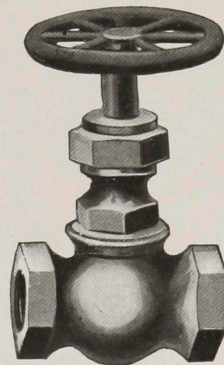
Pop Safety Valve

Size	Price
3/4 inch	...
1 "	...
1 1/4 "	...
1 1/2 "	...
2 "	...



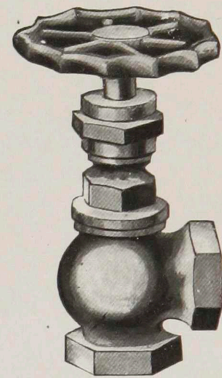
Throttle Valve
With Iron Body

Size	Price
1 inch	...
1 1/4 "	...
1 1/2 "	...
2 "	...
2 1/2 "	...
3 "	...
3 1/2 "	...
4 "	...
4 1/2 "	...



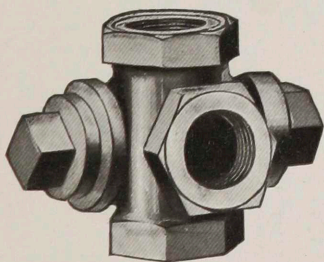
Globe Valve

Size	Price	Size	Price
3/8 inch	...	1 1/2 inch	...
1/2 "	...	2 "	...
3/4 "	...	2 1/2 "	...
1 "	...	3 "	...
1 1/4 "	...	3 1/2 "	...



Angle Valve

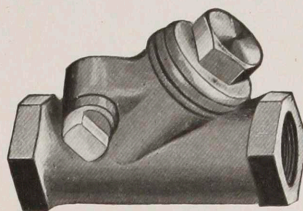
Size	Price	Size	Price
3/8 inch	...	1 1/2 inch	...
1/2 "	...	2 "	...
3/4 "	...	2 1/2 "	...
1 "	...	3 "	...
1 1/4 "	...	3 1/2 "	...



Three Way Exhaust Cock

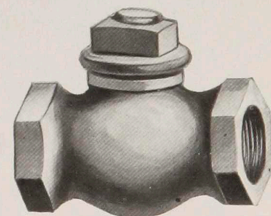
IRON

Size	Price	Size	Price
1 1/4 inch	...	2 1/2 inch	...
1 1/2 "	...	3 "	...
2 "	...		



Straightway Check Valve

Size	Price	Size	Price
3/8 inch	...	1 1/4 inch	...
1/2 "	...	1 1/2 "	...
3/4 "	...	2 "	...
1 "	...	2 1/2 "	...

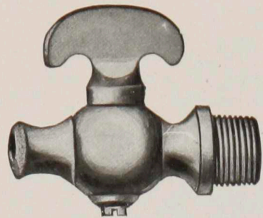


Horizontal Check Valve

Size	Price	Size	Price
1/4 inch	...	1 inch	...
3/8 "	...	1 1/4 "	...
1/2 "	...	1 1/2 "	...
3/4 "	...	2 "	...

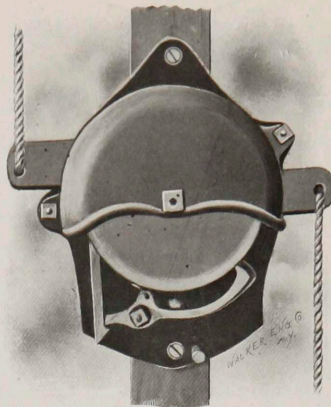
Steam Fittings

Of Superior Quality

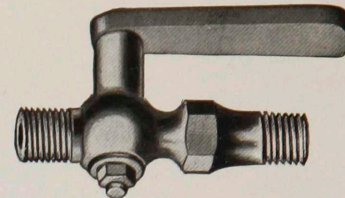


Air Cock

Size
 $\frac{1}{4}$ inch.....\$
 ".....\$

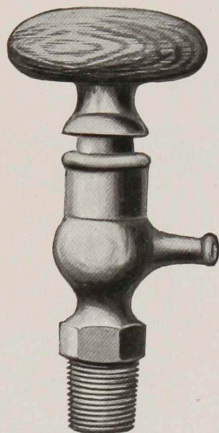


Carlson Signal Bell



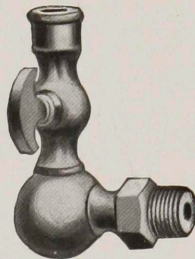
Lever Cylinder Cock

Size
 $\frac{1}{4}$ inch.....\$
 ".....\$



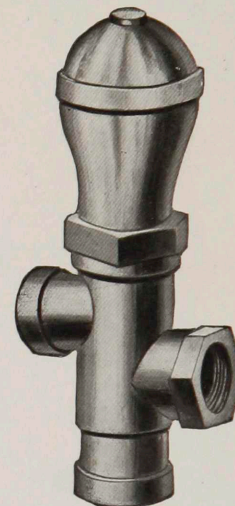
Gauge Cock

Size
 $\frac{3}{8}$ inch.....\$
 ".....\$



Steam Gauge Syphon

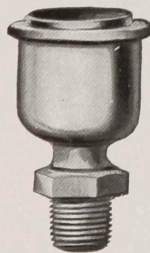
Price.....\$



Pump Valve

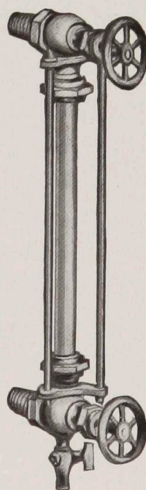
With Air Chamber

Size
 $\frac{3}{4}$ inch.....\$
 1 ".....\$



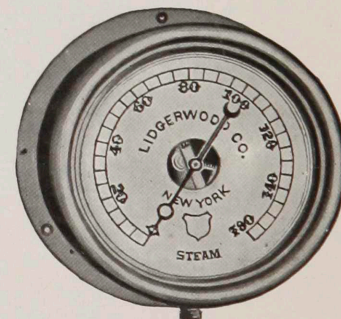
Oil Cup

No.	Thread for Pipe	Price
33	$\frac{1}{4}$ inch.....	\$
34	".....	\$
35	".....	\$
36	".....	\$



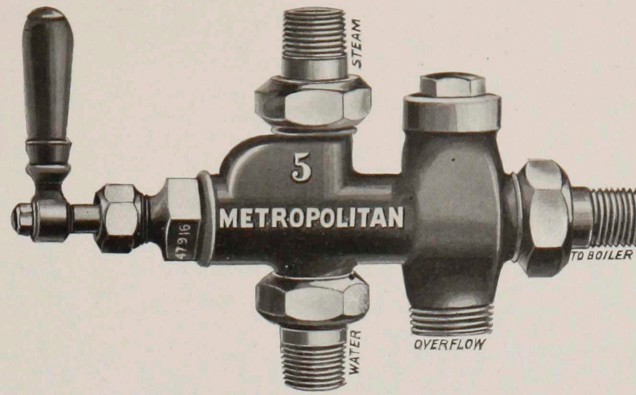
Water Gauge

Size Pipe	Length of Glass	Price
$\frac{1}{2}$ inch.....	10 inch.....	\$
".....	11 ".....	\$
".....	14 ".....	\$



Steam Gauge

Size	Price
$5\frac{1}{2}$ inches, with Iron Case....	\$
$5\frac{1}{2}$ " with Brass Case....	\$



Metropolitan Automatic Injector

THESE Injectors are made entirely of the best new metal with the most improved machinery. The workmanship is perfect.

They are operated entirely by one handle.

They are absolutely reliable. They always lift the water, and when started run steadily **without any adjustment of any valve in the suction pipe for varying steam pressures.**

They can be used as a lifter or non-lifter.

Their construction is simple. The tubes are arranged upon the correct principle to obtain the greatest possible range and best resist the wear.

The valves and tubes can be removed without the use of special tools.

TABLE OF SIZES, ETC.

Sizes	Prices	Size of Pipe Connections			Capacity with Steam Pressure 85 lbs., 2-foot Lift	Horse Power
		Steam	Suction	Delivery		
2	\$15.00	3/8	3/8	3/8	60 gals.	4 to 6
3	16.00	3/8	3/8	3/8	80 "	6 to 8
3 1/2	18.00	1/2	1/2	1/2	120 "	8 to 15
4	20.00	1/2	1/2	1/2	165 "	15 to 20
5	25.00	3/4	3/4	3/4	250 "	20 to 30
6	30.00	3/4	3/4	3/4	350 "	30 to 45
7	40.00	1	1	1	500 "	45 to 65
8	45.00	1	1	1	600 "	65 to 80
9	55.00	1 1/4	1 1/4	1 1/4	800 "	80 to 100
10	60.00	1 1/4	1 1/4	1 1/4	1000 "	100 to 130
11	75.00	1 1/2	1 1/2	1 1/2	1300 "	130 to 170
12	90.00	1 1/2	1 1/2	1 1/2	1750 "	170 to 230
13	110.00	2	2	2	2300 "	230 to 300
14	125.00	2	2	2	2850 "	300 to 375

Steam Pumps—For Feeding Boilers

TABLE OF SIZES, ETC.

Number	Diameter of Cylinders in Inches		Length in Inches of Stroke	Gallons per Stroke	Gallons per Minute	Diameter of Pipes in Inches				PRICE
	Steam	Pump				Suction	Discharge	Steam	Exhaust	
1	3 1/2	2	4	.055	10	1 1/4	1	1/2	3/4	\$
1 1/2	4 1/2	2 1/2	5	.11	20	1 1/4	1	1/2	3/4	
2	5	3	7	.22	30	1 1/2	1 1/4	3/4	1	
3	6	3 1/2	7	.29	40	2	1 1/2	1	1 1/4	
3 1/2	7	4	7	.38	60	2 1/2	2	1	1 1/4	

HAND LEVER ATTACHMENTS FURNISHED WITH THE ABOVE WITHOUT EXTRA CHARGE.

NOTE.—For making steam connections to Boilers, either of Inspirators, Injectors, or Pumps, we charge extra.

Patents

Having expended a large amount of money and time in experimenting and perfecting the operation of our cableways and in acquiring patents, etc., we are obliged to notify the trade and consumers that any infringement of our patents will be promptly prosecuted.

We Manufacture Under the Following Patents, viz:

N. C. HARRIS,
Nov. 27, 1888.
WILLIAM BAPTIST,
April 2, 1889. Dec. 31, 1895.
Dec. 4, 1900. June 9, 1896.

DRAKE AND STRATTON,
Sept. 20, 1892.

C. M. NORTH,
Dec. 29, 1891. March 15, 1892.
Aug. 2, 1892.

JOHN TRAINOR,
Dec. 24, 1895.

J. TEMPERLEY,
Aug. 29, 1893.

C. VIVIAN,
July 3, 1894.

F. B. KNIGHT,
April 12, 1898.
July 25, 1899.

W. F. COURSEN,
Feb. 9, 1897.

THOS. SPENCER MILLER,
Aug. 19, 1890. March 10, 1891.
Aug. 25, 1891. May 3, 1892.
July 5, 1892. April 25, 1893.
Aug. 15, 1893. Aug. 22, 1893.
June 5, 1894. July 24, 1894.
April 30, 1895. Aug. 28, 1894.
Sept. 10, 1895. Sept. 3, 1895.
June 2, 1896. Dec. 17, 1895.
Feb. 16, 1897. Dec. 24, 1895.
July 6, 1897. Dec. 29, 1896.
March 22, 1898. April 13, 1897.
April 5, 1898. March 29, 1898.
Nov. 14, 1899. April 18, 1899.
May 21, 1901. Nov. 14, 1899.
Dec. 10, 1901. June 18, 1901.
Nov. 4, 1902. Jan. 29, 1902.
Dec. 2, 1902. March 4, 1902.
Oct. 7, 1902. Dec. 23, 1902.
Dec. 30, 1902. Jan. 6, 1903.

MILLER AND COVELL,
Jan. 9, 1894.

WILHELM DUSEDAY,
Oct. 29, 1895.
Sept. 1, 1896.
Sept. 1, 1896.

E. T. MOORE AND H. B. TEFFT.
Sept. 24, 1889.

H. L. REYNOLDS AND H. W. KETCHUM,
May 8, 1894.

J. H. DICKINSON,
Three Patents, April 11, 1893.
One Patent, Sept. 17, 1895.
One Patent, Oct. 29, 1895.
One Patent, Jan. 28, 1896.
One Patent, July 21, 1896.
Two Patents, Oct. 27, 1896.
One Patent, Mar. 23, 1897.

J. V. BEEKMAN,
June 10, 1890. June 12, 1888.
June 18, 1895. Aug. 14, 1894.
June 9, 1896. Feb. 25, 1896.

April 2, 1901.
A. M. MULLINEX,
Sept. 10, 1895.

C. H. LOCHER,
Oct. 27, 1896. Dec. 1, 1896.

H. N. COVELL,
March 21, 1899. Oct. 24, 1899.
Feb. 6, 1900. May 20, 1902.
Oct. 14, 1902.

MILLER AND DICKINSON,
Aug. 20, 1901. Dec. 10, 1901.

E. F. TERRY,
Nov. 22, 1898. Sept. 3, 1901.

S. MATTON,
Feb. 13, 1900. June 19, 1900.
July 3, 1900.

A. J. FRITH,
Feb. 5, 1895.

P. OLSEN,
Nov. 11, 1902.

Also No. 492,648, Feb'y 28, 1893.
" 516,084, March 6, 1894.
" 535,219, March 5, 1895.
" 555,080, Feb. 25, 1896.
" 561,973, June 16, 1896.
" 585,964, July 6, 1897.
" 595,523, Dec. 14, 1897.
" 636,768, Nov. 14, 1899.
" 685,579, Oct. 29, 1901.
" 685,580, Oct. 29, 1901.
" 694,355, March 4, 1902.
" 717,176, Dec. 30, 1902.

COVELL & BAECHTOLD,
Dec. 9, 1902.
Dec. 16, 1902.

Other Patents Pending.

ESTIMATES

for cableways for hoisting and conveying purposes, or for any special work, will be furnished upon receipt of detailed information as to the duty required, etc. As it is usually necessary to have an accurate profile of the ground in order that we may be able to make the proper plans for erection, construction and height of towers, distance of anchorage from towers, etc., we prefer wherever possible to have one of our cableway engineers make a personal inspection of the ground and make all necessary measurements; and also to consult with parties contemplating the use of a cableway. No charge is made for this service. We furnish complete plans for the erection of cableways, towers, etc., from which the whole plant can be erected without difficulty by engineers in charge, with the supervision of one of our cableway erectors.

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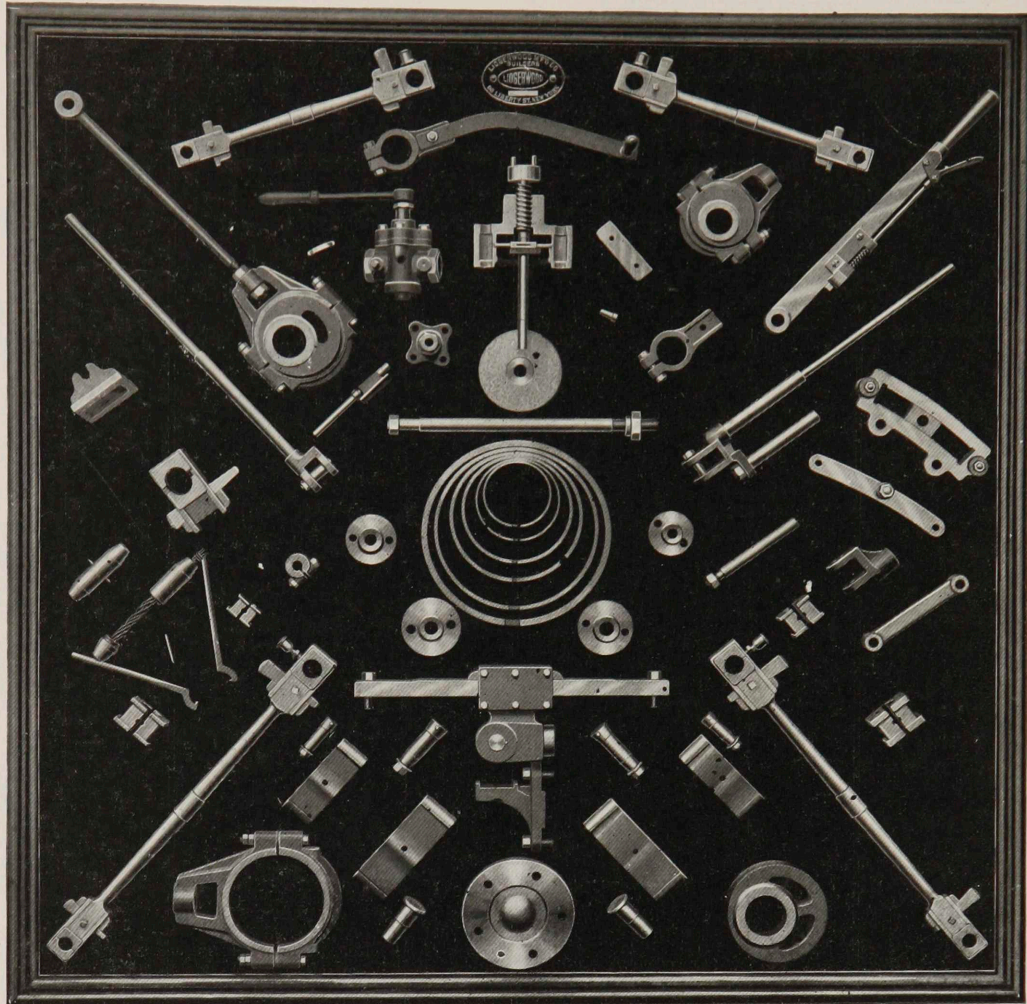
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5	59¼	96	132				
6	59¾	97	93 Blast Furnace Hoist.	133	40 Drum and Winch Erecting Engine.		
6½	55½	97¼		134			
7	56½	98		135			
8	57½	99		136			
8½	58½	100	37 Double Side-by-Side Drum Engine and Boiler.	137	46 Three-Drum Engine and Boiler.		
9	59½	101		138			
10	59⅝	101¼		139			
11	59⅞	102	38 Double Side-by-side Drum Engine.	140	47 Three-Drum Engine.		
12	60	102½		141			
9½	61	106¼		68 Mining Engine, Lagged Drums.		137½	
10½	62	107¼				138½	
13	63	108¼	139½				
14	64	109¼	140½				
14½	65	109⅛	67 Double Drum Reversible Mining Engine.	141½			
15	66	109⅜		142			
15½	66⅞	107		143			
16	66¾	108		144			
16½	64½	109	53 Heavy Quarry Engine.	145			
17	65½	109⅞		146			
18	66½	109¾		147			
19	66⅝	107½		148			
20	66⅞	108½	73 (Not illustrated)	149			
20½	67	109½		150			
21	68	109⅝		134 Inclined Cableway Engine.	151		
22	69	109¾			152		
23	70	107½	153				
24	70	108½	94 Ship's Winch.				
25	67½	109½		154			
26	68½	109⅝		155			
27	69½	109¾		156			
28	70½	109⅞	99 Swinging Engine.	157			
29	70⅞	110		158			
30	70⅞	111		159			
31	70⅞	112		126=127 Cableway Engine.			
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33	70¾	113½	171				
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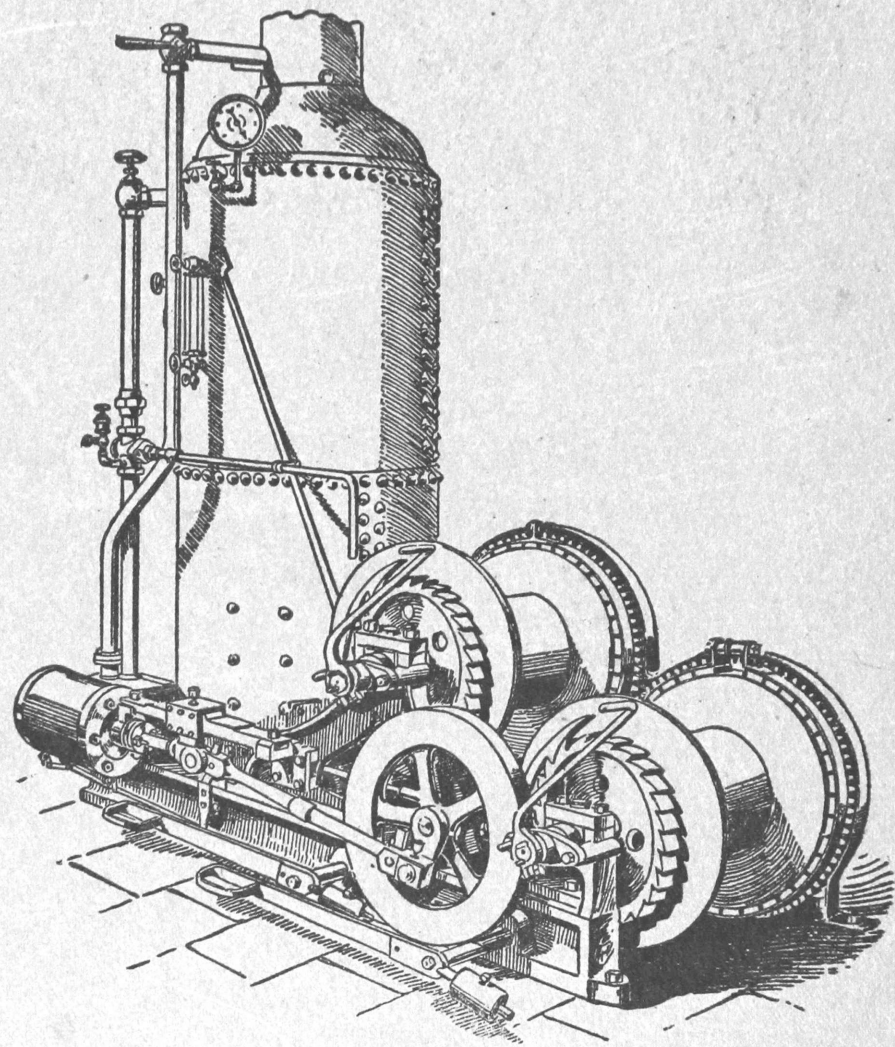
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