A STUDY OF CONCRETE MIXER TYPES

Thesis for the Degree of B. S.

L. L. Cornetet

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THESIS

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A STUDY OF CONCRETE MIXER TYPES

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FOREWORD

"QUALITY is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillful execution; it represents the wise choice of many alternatives, the cumulative experience of many masters of craftsmanship and it also marks the quest of an ideal after necessity has been satisfied and usefulness achieved."

--L.M. Johnson

A STUDY OF CONCRETE MIXER TYPES.

A century ago this country was a land of very crude methods and ideas. Caravans were slowly creeping along poor wagon trails, fording rivers, and struggling up mountains. Cities were built of wood, and a few years later they were being completely destroyed by fire. Machinery and power were very little thought of; man lived mostly by his strength. One hundred years ago Portland cement was an unknown thing to man.

The flight of time has brought many great changes in the years since then, changes both in methods and machinery. An industry has sprung up from insignificance to gigantic proportions. An industry which has made this civilized age of ours an age of speed and production, an age of pleasure and real living. This industry plays a very important part in every man's life as he travels over the country side. This is an age of concrete.

Twenty years ago there were 591,416 square yeards of concrete roads in the United States. Think of it, the equivalent of only 58 miles of 18 foot pavement. Today 50,000 miles of long gray ribbon stretch across our continent, enough to twice encircle the globe. Sky scrapers 800 feet high reach up into the heavens. Automobiles speed across the country at 60 and 70 miles an hour. Times have indeed changed. This is an age of ever increasing speed, output, and profit, and all due to concrete.

Concrete as a construction material is often referred to as having a thousand and one uses. It is true that in the past few years it has come to occupy a position of importance that no one could have predicted twenty years ago simply because comparatively little was known of its possibilities or how to handle it.

In 1900, 8,500,000 barrels of Portland cement was manufactured. In 1927 more than 200,000,000 barrels was produced. This rapid increase is due to the many more uses found for concrete and the development of machines to mix it. Almost all of this has gone in the charging door of some make of mixer and came out concrete. Very little of it has produced concrete in its strongest and most durable form.

This lack of maximum strength and durability has partly been due to the inability of the mixer to produce high grade concrete and partly due to outside forces governing the machine. In this report I will try to compare the present day machines showing their good and bad points in design which leads toward the production of maximum strength concrete.

Seventy five years ago the first concrete mixer was put on the market. It was a very simple machine consisting of a horizontal shaft with vertical blades mounted so as to revolve in a cylinder. (Figure 1.) Since then a long process of evolution has taken place until today we have many makes and designs of machines. Some are good, and many are not so good.

Today the contractor demands dependability of performance and speed as the vital requirements of a mixer. Tomorrow the contractor will be forced to demand not only these factors but a far more important item: - QUALITY.

We are rapidly passing into an age of engineering where

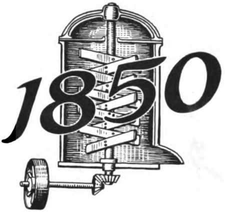


Figure 1. Showing the developement of the concrete mixer.

things are not just built, but are first designed in every detail. More and more every day, specifications are calling for a designed mix of concrete with a certain strength required. Some concrete mixer manufactures are trying to keep pace with these requirements in building their machines. Many others are handicapped from getting the best design by possible patents. Others still think that quantity and not quality is what the contractors and builders demand, and they still hold to their old designs.

Due to the above factors there are a large number of types of mixers upon the market. They all have good and bad points in their designs. In the following pages I will give a list of the leading manufacturing companies and an outline of different designs of the parts that go to make up their respective machines, and then try to compare them giving the good and bad points of each.

LIST OF COMPANYS AND OUTLINE OF DETAIL DESIGN.

COMPANY	FRAME	AXLES
Jaeger	Three point suspension. Hot riveted,	Solid axle Roller Bearing Wheel.
Koehring	Three point suspension. Hot riveted.	Solid Axle.
Multi-foote	Four point suspension. Hot riveted.	Solid Axle.
Knicker-bocker	Three point suspension. Arc welded, bolted.	Solid Axle.
Oshkosh	Three point suspension. Hot riveted.	Solid Axle.
Ransome	Three point suspension. Hot riveted.	Built up Axle.
Rex	Three point suspension. Hot riveted.	Solid Axle. Chain drive.

LIST OF COMPANYS AND OUTLINE OF DETAIL DESIGN. (Cont.)

COMPANY	ROLLERS	DRUM
Jaeger	No rollers. Central shaft.	Pat. Flat spot. Tilt type. Improved twin blades.
Koehring	Revolving Shaft. Beveled car-wheel type.	5 action re-mixing drum.
Multi-foote	Timken roller bearings.	5 action. Balanced Load.
Knicker-bocker	Trunnion Rollers. Revolving shaft, Car wheel type.	5 action mix.
Oshkosh	Phosphor bronze bearing.	5 action mix.
Ransome	Hyatt roller bearing.	5 action mix.
Rex	Timken roller bearing. Chilled steel rollers.	4 action mix. Ten bucket drum.

LIST OF COMPANYS AND OUTLINE OF DETAIL DESIGN, (cont.).

COMPANY	DRUM CONSTRUCTION	SKIP
Jaeger	Semi steel. Gear drive.	Flat. Automatic shaker. Two cable hoist.
Koehring	Steel built up drum. Double gear drive.	Double continuous 2 cable.
Multi-foote	Pressed steel. Double gear.	Single cable hoist.
Knicker-bocker.	Pressed steel. Chain drive.	Two cable hoist.
Oshkosh	Cast semi steel. Chain drive.	Two cable hoist.
Ransome	Steel drum. Single gear drive.	Two cable hoist.
Rex	Heat treated steel drum Chain drive.	Two cable hoist. Stream line skip.

LIST OF COMPANIES AND OUTLINE OF DETAIL DESIGN (cont.).

COMPANY	WATER TANK	BATCH TIMER.
Jeger	Pat. Tilt and pour tank.	Time control.
Moehring	Syphon type. Three way valve.	Time control. Locks drum.
Multi-foote	Syphon type. Three way valve.	Gear driven. Locks drum.
Knicker-bocker	Syphon type. Three way valve.	Time control. Locks drum.
Oshkosh	Three way valve.	None.
Ransome	Syphon type.	None.
Rex	Micrometer regulator.	None.

LIST OF COMPANIES AND OUTLINE OF DETAIL DESIGN(Cont.)

COMPANY	DISCHARGE CHUTE	BOOM AND BUCKET
Jaeger	No discharge chute	Separate Control.
Koehring	Straight one piece pivoted inside.	Power control. Self spreading bucket.
Multi-foote	Rotary chute Power operated.	Power control. Double doors.
Knicker-bocker	Straight one piece Extremely large.	None.
Oshkosh	Straight one piece. Power operated.	None.
Ransome	Two piece Hand control.	Power Control Bottom dump.
Rex	Two piece. Power control.	Power control. Gate bucket.

LIST OF COMPANYS AND OUTLINE OF DETAIL DESIGN, (Concl.)

COMPANY	TRANSMISSION & ENGINES	CONTROL
Jaeger	Open gear box. Le Roi.	One man end control.
Koehring	Closed gear box. Waukesha & Le Roi.	One mane end control.
Multi-foote	Closed gear box. 4 cylinder Hercules.	One man clear view control.
Knicker-bocker	Open gears. Le Roi.	One man control.
Oshkosh	Open gears. Fuller and Johnson.	One man control.
Ransome	Open Gears. Le Roi.	One man control.
Rex	Closed gear box. Waukesha.	Pat. Mechanical Man. One man control.

The different parts of the machine will be taken separately and discussed showing the variations in design and pointing out the advantages and disadvantages of each one.

FRAME

Seventy five percent of the machines in the above outline have three point suspension frames. This three point suspension prevents twisting of the frame when traveling over rough and uneven roads. Strains set up by uneven footing never reaches the chassis. (Figure 2.)

The "Multifoote" machine has a four point suspension frame which gives the mixer a much more firm and solid foundation for its real work of mixing and pouring concrete. On rough ground though this machine would have to be leveled up each time before it could be run. This disadvantage outweighs the advantage of the solid foundation.

All but one of the above make of mixers have frames made of structural steel hot riveted together. This makes a rigid frame that will not be loosened by vibration or strain, and gives perfect alignment to all moving parts. (Figure 3.). The "Knickerbocker" frames are built as one piece. All parts are arc welded together. This gives an added precaution for strength, but the hot riveted frame gives good service in most all types of machines.

I believe the best type of frame would be a structure built of structural steel hot riveted together with three point suspension.

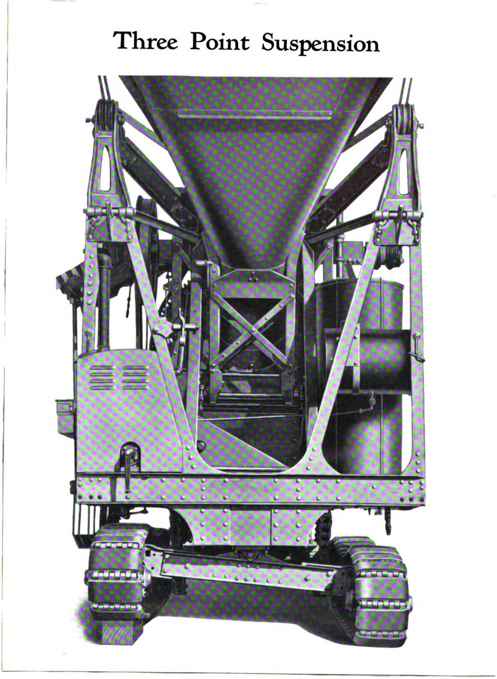


Figure 2 -- Showing the flexibility of the three point suspension frame.

Figure 3.- The hot riveted structural steel frame.

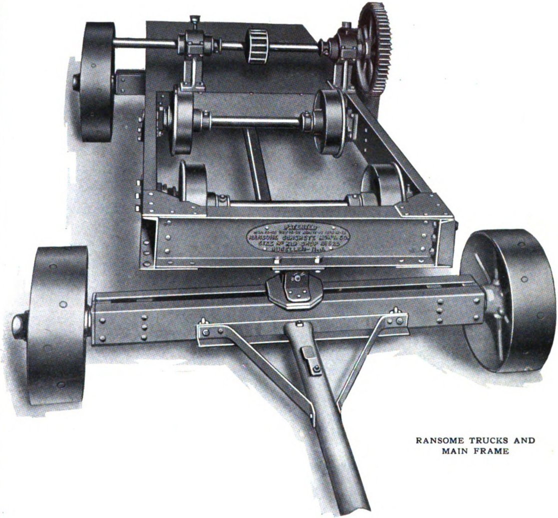
WHEELS AND AXLES.

The Ransome people are the only company who equipped their machines with a built up axle. This axle is made up of two channel irons with stubs riveted in the end. (Figure 4.) The other six companys hold to the solid axle which has given good service.

All make of mixers may be bought equipped with any design of wheel, the steel or rubber, being the common types. These wheels may be obtained in any size, diameter, and width desired. Some of the manufactures equipped their wheels with roller bearings which gives an advantage over the flat bearing, due to the less wear on the axle and more ease in moving.

The pavers are all mounted on crawlers mostly all of the same design. All of them are very good. They are all power steered.

The solid axle and roller bearing equipped wheels are the most used type. Today they seem to give the best service over a long period of time.



RANSOME TRUCKS AND MAIN FRAME

Ransome Trucks

Figure 4.- The Ransome trucks showing the the built up axle.

ROLLERS

The rollers which support the drum are one of the most important items on the mixer. They are subject to the hardest wear of all the moving parts of the mixer. The defect of the common construction is that the heavy down thrust of the tumbling materials in the drum subject the top of the fixed bearing of the roller to extraordinary hard wear. This enlarges the diameter of the roller hubs producing flat faces against the fixed stationary axles. After a short time this causes disalignment of the drum which sets up heavy vibrations throughout the entire mixer causing rapid wear on the faces of the rollers, runways, and gears.

Some of the companys have been trying to overcome this defect and are partly succeeding in one way or another. The Jaeger people solved this trouble by not having rollers at all but mounting the drum on a central shaft which is roller bearing equipped. (Figure 5.).

The Koehring and the Knickerbocker companys key the rollers to the shaft and support the shaft with large babbit bearings. This method gives much more bearing surface; and since the rollers both revolve at the same rate of speed, the shifting of the load in the drum does not effect the rate of wear. Since these usually are split bearings, shims may be removed to take up the play as the bearing wears. This design is a big improvement over the old type. (Figure 6.)

The Oshkosh Company has an extra large phosphor bronze bearing in the roller and an oil reservoir to supply a con-

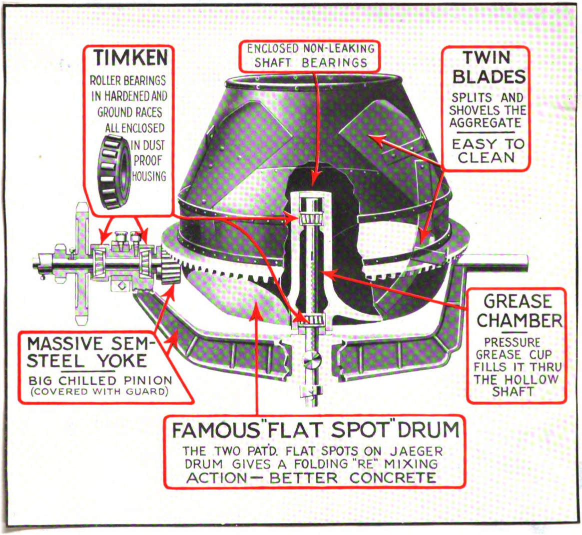


Figure 5.- The Jaeger drum showing the famous "flat spot" and the central mounting.

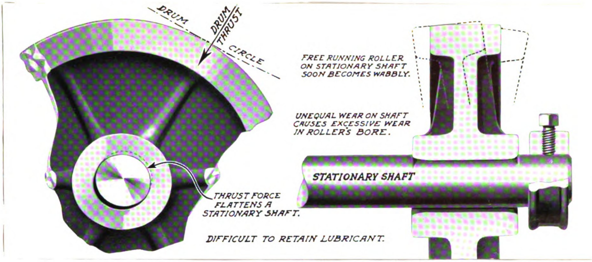


Figure 6 A.-,The old type of trunions showing the unequel wear of the shaft.

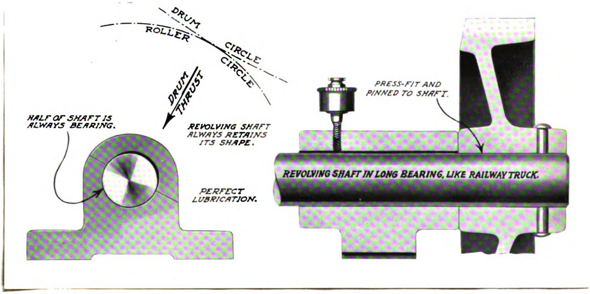


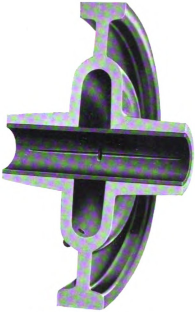
Figure 6 B.- The Koehring type of drum roller assembly showing the wear of the bearing with a revolving shaft.

stant lubrication for the bearing surface. (Figure 7.)

The remainder of the companys have their rollers equipped with roller bearings. This, after all, seems to be the best solution for the problem. Roller bearings under most all conditions cause the least amount of friction and wear and will therefore stand up under the heavy load of the drum. Tapered roller bearings are usually used which allow the play to be taken up as the bearing wears. (Figure 8.)

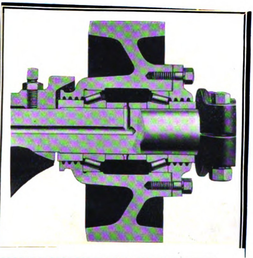
In all cases the rollers are made of steel, usually car wheel steel, chilled on the face and ground to a true surface. The Ransome Company uses a flanged wheel which aids in keeping the drum running true.

The best type of trunon rollers are the ones made of chilled car wheel steel and mounted on roller bearings.



Nos. 14S, 21S and 28S Drum Rollers

Figure 7.- Showing the Oshkosh drum roller construction. Note the oil reservoir.



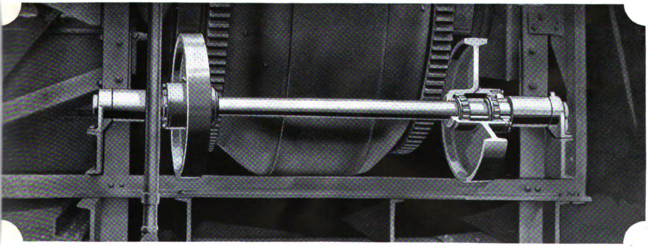


Fig. 8—Here is Foote's answer to the much discussed question of whether it is better to let drum rollers revolve on the shaft or to key them to the shaft, from the standpoint of bearing service. Timken bearings as installed in MultiFoote drum rollers are guaranteed for life.

Figure 8.- The trunions equipted with roller bearings.

DRUM

There were 200,000,000 barrels of Portland cement made last year in the United States. Ninety five percent of this went into the charging door of a mixer and after going through a certain amount of mixing action came out in the form of concrete. This concrete has varied in strength and durability from the very poorest to a high grade material. The most of it was in the poorer class. This variation has been caused partly by outside forces governing the mixer, but it is mostly due to the design of the drum itself.

The mixing action, caused by the shape of the drum and design of the blades which the materials get while in the drum, constitutes the most important item in concrete making. All the companies knowing this fact have designed and redesigned their drums until today each have a distinct mixing action of their own.

The Jaeger in their tilting drum machine have what is known as the Famous Flat Spot Drum. This patented drum with its two flat spots (Figure 9) or surfaces on the bottom of the bowl folds the concrete over; the cone shape flops it back while the improved twin blades slice across the mass splitting it up and shovelling it giving a thorough mix for dry sticky concrete as well as sloppy concrete. This mixing action occurs sixty times per minute. There is one disadvantage in this type of drum, and that is the fine part of the mix settles to the bottom and the coarse remains on the top. In other words seggregation occurs. This mixer is a much used and very well liked machine regardless of the

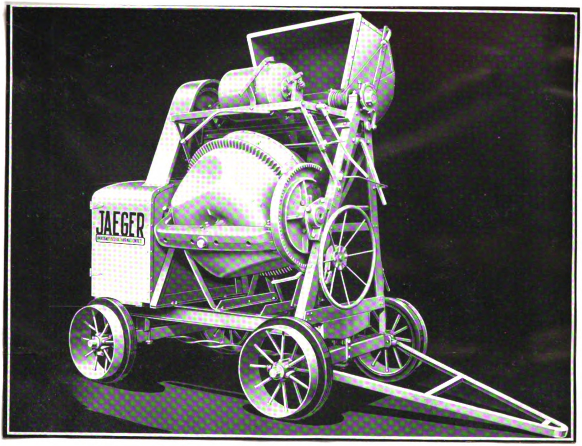


Figure 9.- The Jaeger Mixer showing the famious "Flat Spot" drum.

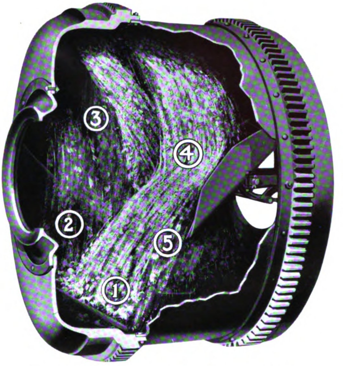
above disadvantage.

The Koehring Re-Mixing drum has a distinct five phase mixing action. (Figure 10). First, the diagonals cut through the material in the bottom of the drum. The second, action develops as the blades carry the material upward with the motion of the drum to a point where they fall backward against the motion of the following blades. A third action takes place when these blades clean themselves of all materials, showering it down across the length of the mixing chamber to the discharge side. Here the "pick up" buckets pick up the material and carries it to the top at which point, it is thrown downward against the inverted discharge chute with a violent break-up effect which is the fourth action. The reversed discharge chute then deflects the materials in a spraying shower back to the over throw blades which completes the cycle.

This remixing action gives a very uniform batch of concrete because the materials are prevented by the buckets from seggregating. It has this advantage over the Jaeger tilt drum mixer.

The Multifoote double cone drum has about the same mixing action as the Koehring except that the materials are carried a little nearer the center of the drum due to the shape and length of the buckets. (Figure 11). This detail balances the load giving a more even running drum. This drum has about the same good advantages as the Koehring machine.

The Knickerbocker machine has almost the same design of drum as the last two mentioned. (Figure 12.) On one project the 10-S Knickerbocker 2 bag machine was giving a workable



Koehring five action re-mixing principle, producing
Dominant Strength Concrete.

Figure 10.- The Koehring drum showing the five phase mixing action.

Note the two cone construction.

Figure 11.- The Multifoote drum showing the five phase mixing action.

mix using a 1-4½ mix in 30 seconds after all the materials were in the drum. A large amount of water had to be used to obtain this mix in so short a time though.

The Oshkosh Machine has the same type drum as the Koehring. The five motion action is developed. (Figure 13.)

The Ransome also have the same shaped drum and blades as the above giving the same mixing action. (Figure 14.)

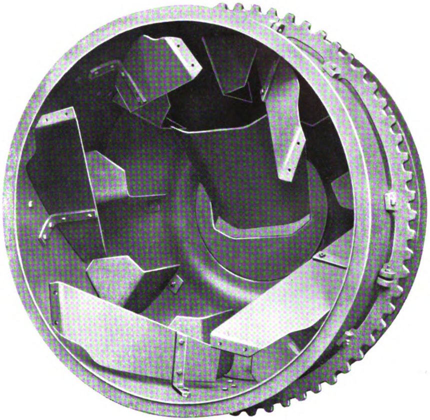
The Rex people employ a slightly different mixing action. The blades are about the same shape, but instead of five there are ten large deep buckets which shovel the material in a distinct action of their own. The discharge chute is not employed in this action. (Figure 15.)

The most of the different companys employ a modified form of the five phase mixing action which seems to give the best results because it gives good concrete with the least amount of seggregation.

<u>Drum Construction and Drive.</u>

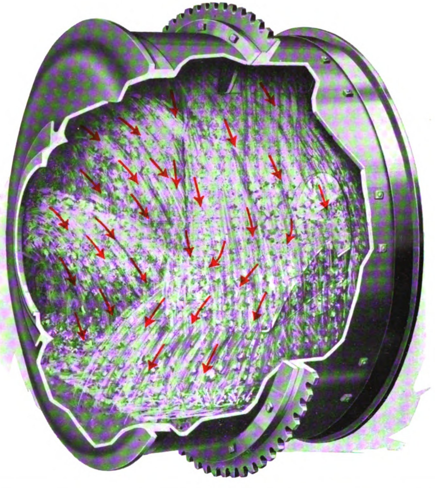
Sixty percent of the drums are driven either by a single or double ring and pinion gear. The remainder are all chain driven. The double gear has this advantage in that it lessens the twisting strain in the drum when it is unevenly loaded. Otherwise the two above types are giving very good service.

Most all the drums are made up of cast semi steel or pressed steel. The Koehring Company are a little different in constructing their drums. Theirs being built up of three pieces consisting of two drum heads made of special composition metal which has high resistance to abrasion and a high carbon steel shell in the center (Figure 16.) This design



The Knickerbocker Drum

Figure 12.- The Knickerbocker drum.



OSHKOSH DRUM SHOWING THE SPECIAL FIVE MOTION MIXING ACTION USED IN ALL OSHKOSH MIXERS

Figure 13.- The Oshkosh drum shohing the mixing action,

RANSOME MIXING BLADES

Figure 14.- The Ransome drum showing the shape of blades.

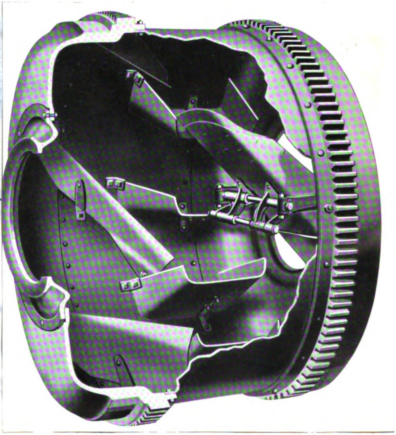


Figure 16.- The Koehring Drum showing the two drum hears and shell.

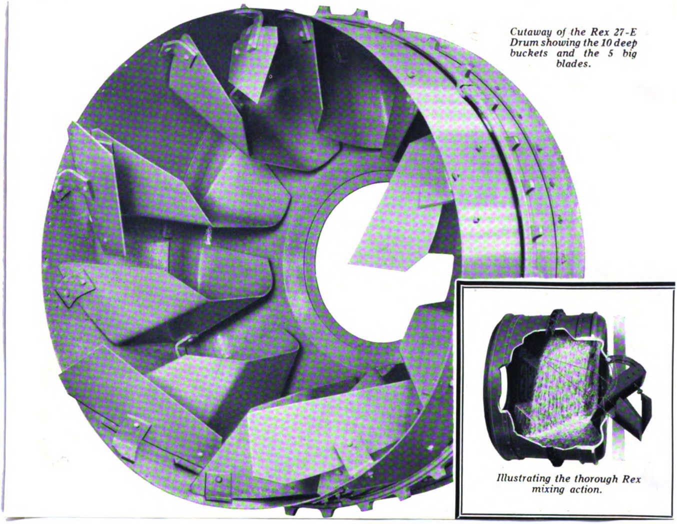


Figure 15.- The Rex drum showing the ten large buckets and the mixing action they produce.

makes a strongly constructed drum, and one which will stand a lot of wear.

The Multifoote company build a drum made of two cones held together at the center by a steel band. (Figure 11.) This design is much better than the others in that there are no corners inside the drum for the concrete to lodge and harden. This gives a natural scouring and cleaning action which has many advantages.

SKIP

The skip on most all machines is built as a metal box fastened to a frame which is so constructed that it can be elevated to an angle of fifty or more degress for unloading. One or more cables are attached to it; and then run over pulleys to furnish the power for elevation. About the only difference in design of any of these skips is the number and attachment of these cables, and the methods employed in shaking the material out of the skip.

The usual method in the past to remove this clinging material has been to pound on the elevated skip thereby jarring the materials loose. The Jaeger people is the only company who have made some attempt to improve this crude method. They have developed and patented an Automatic Shaker which after the skip is raised automatically sets into operation a vibrator that shakes the skips, causing a continuous flow of all the material. (Figure 18.) This is a wonderful improvement over the old method of beating the skip.

The Multifoote have changed the hoisting design by using only one cable instead of two to elevate the skip. This cable is attached to a bail that absorbs both tension and compression strains which prevent the skip and frame from being effected by uneven loading. I do not believe the advantage gained merits the extra design since the double cable is giving very satisfactory results.

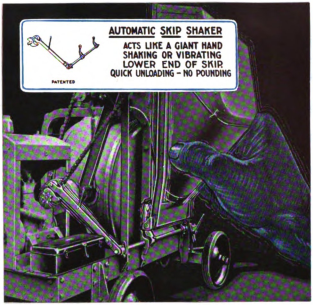
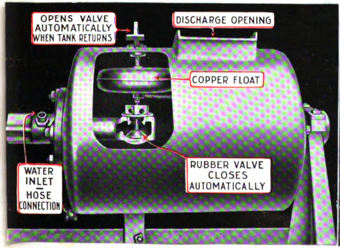


Figure 18.- Showing the Jaeger
Automatic Skip Shaker.



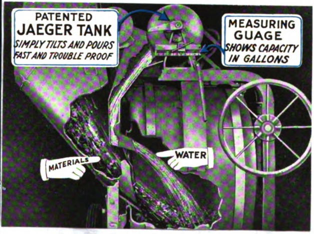


Figure 19.- Showing the Jager water tank.

WATER CONTROL.

The most important element in 1928, '29, '30, concrete will be water. In past years very little attention was paid to the amount of water that went into the concrete just as long as it could be handled. After long years of research and study the Water-Cement Ratio Strength Theory has been proven a law. It states as follows: For given materials and conditions of manipulation, the strength of concrete is determined solely by the ratio of the volume of mixing water to the volume of cement so long as the mixture is plastic and workable.

This law has completely changed the design of a mix or the mixing of concrete. To meet the needs of this change the manufacturers must redesign their water control systems so that the water getting into the batch can be very accurately measured. Many of the companies are rapidly improving their water tanks so that their mixers can live up the requirements specifications demand.

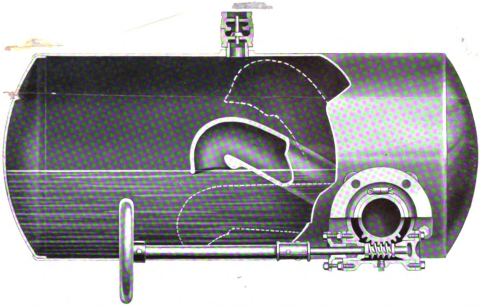
The Jaeger people have a patented tank of very simple design and which gives an accurate amount of water each time. The tank fills up automatically when tilted up until a copper float on the inside (Figure 19.) shuts off the intake valve. When ready the tank is then tilted by a lever at a certain degree governed by a stop set on a measuring gauge, and the water runs out. This method gives an accurate amount each time if the tank is always level, but when it is not level the amount changes. This is the only fault of this system.

The Koehring Company have developed a satisfactory syphon system. (Figure 20.) The water enters the tank through a three way valve. As the charging skip comes up it automatically opens the balanced three way valve starting the discharge of water. In this method the water always enters the drum before the other materials, which is a very good feature. The regulating pipe or syphon pipe draws all the water out of the tank down to the level of the mouth of the pipe. The height of this pipe can be set and then lock in position so that the amount cannot be changed by the operator. This is another important detail. This system seems to be one of the best of the syphon type.

The Multifoote Company use the three way valve and syphon type tank but hardly any improvements have been put on their tanks.

The Knickerbocker people build a water tank similar to the Koehring, the only difference being the control of the syphon action. The amount of water entering is governed by a flexible tube (B Figure 21.) which stops the action by letting air enter the stand pipe when the water in the tank reaches the level of the tube. The height of this tube is governed by a control lever E. This system will deliver water to the drum with a variation of not more than a half pint plus or minus the desired amount.

The Oshkosh water control system has the three way valve but does not employ the syphon draw out feature. Instead they have a stand pipe inside the tank which can be raised



The Koehring hooded intake pipe does away with slow flow and dribbling. The siphoning effect of this device keeps the full diameter of the pipe buried in the water. See description on next page.

Figure 20.- The Koehring Water Tank.

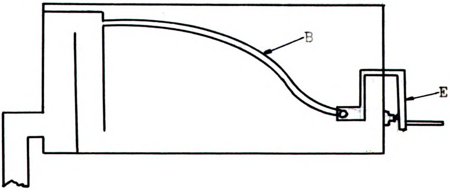


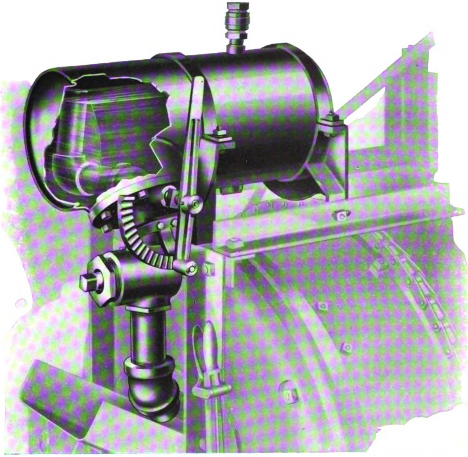
Figure 21.- The Knickerbocker type of Water Tank, showing the flexible tube.

or lowered that controls the amount of water entering the drum. (Figure 22.) This system is a little slow but accurate.

The Ransome tank is similar to the Knickerbocker tank except the height of the intake pipe of the syphon is raised or lowered instead of a syphon release tube. Also instead of the three way valve, two separate valves are employed. More time is required to operate these valves and they are not any more satisfactory than the single valve. (Figure 23.)

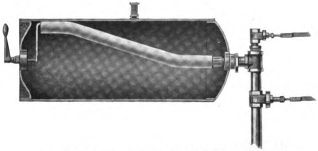
The Rex Company have developed a system entirely different from these other types. They employ a micrometer regulator, which once set delivers water accurately to the pound to each succeeding batch. I do not know the mechanism of this devise but from all reports it has proven very successful.

Of all the above systems described it is hard to say which gives the most accurate supply of water and the best service. The Jaeger system is the simpler in construction and control, there being few parts or valves to get leaky or out of adjustment, and is very fast. The Jaeger and Knickerbocker Syphon three way valve systems have been developed to a high degree of efficiency and are giving good results. The Rex people have an accurate and dependable measuring tank. The remainder of the companies have not done much in the way of improvement.



Water Tank

Figure 22.- The Oshkosh water tank.



RANSOME AUTOMATIC MEASURING WATER TANK

Figure 23.- The Ransome water tank. Note the flexible tube.

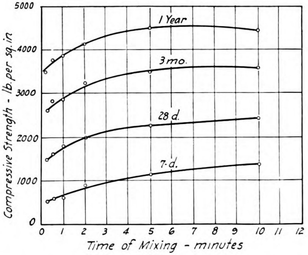


Fig. 2

Typical relation between time of mixing and the compressive strength of concrete.

Figure 24.- Time of mix strength curves.

BATCH TIME.

The Portland Cement Association state that experiments prove that the strength of concrete is increased materially by longer periods of mixing. Typical values from tests are shown by the graphs. (Figure 24.) The rapid increase in strength for different periods of mixing up to about two minutes can be seen on this curve. For instance, concrete of the usual quality mixed for that period is from 30 to 35 per cent, that is, from 500 to 700 pounds per square inch, stronger than concrete mixed only 15 seconds.

In the tests from which these curves were constructed it was found that thorough mixing also makes far more uniform concrete. Specimens made of concrete mixed for only 15 seconds showed an average variation of individual specimens of about 30 per cent from the average strength, while specimens made from concrete mixed for two minutes varied less than ten per cent. Furthermore, thorough mixing gives increased workability, which in turn, requires less labor in placing, and therefore, permits the use of larger quantities of aggregate with a given amount of cement and water in their fixed ratio.

Small changes in the speed of the mixer have little effect on the strength of the concrete. The tests indicate that it is largely the time element of mixing and not the rate of rotation of the mixer that influences the strength and quality. If increased output is needed, it should be obtained by a larger or second mixer.

Investigations show that the mixing time is very seldom thought of upon the average concrete job except to hurry up the mix as much as possible so that a large number of batches can be obtained. The contractor is so anxious to get as many cubic yards as he can out of the mixer each day that the time element is entirely over looked. On one job that I observed the complete charge was in the drum just 20 seconds, a 1 - 4½ mix being used. Observations of other jobs showed that the average mixing time for a small mixer was between 30 and 45 seconds, very seldom a minute, and for larger machines from a minute to a minute and a half. According to the curves two minutes would be a much more satisfactory and economical mixing period.

This shows that some steps have to be taken to hold the contractor or operator to a specified mixing time. Four of the companies have taken this precaution and developed a device by which the time of the mix is controlled. The remainder of the manufacturers have done nothing to maintain a constant mixing period.

The Jaeger Company have an invention on their machines run by clock-work which rings a gong at the end of a given period of time. (Figure 25.) The loading skip sets the mechanism into action as it reaches the top. This is one fault of the design since all the materials have not entered the drum as yet. Another poor detail of the devise is that it does not lock the discharge chute, therefore, the operator does not have to wait on the bell before discharging the batch. If the inspector holds the operator to the gong, though this

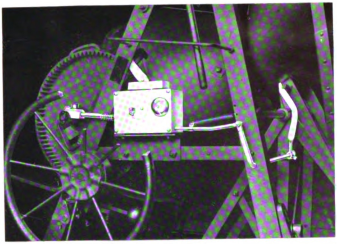


Figure25.- The Jaeger Batchmeter.

This illustration of the Koehring batch meter shows the method by which the discharge chute is automatically locked as soon as the charge enters the drum. The discharge chute cannot be moved until the regulated mixing time has elapsed when it automatically releases the discharge lever and signals the fact with a bell. The meter also registers each batch that enters the drum.

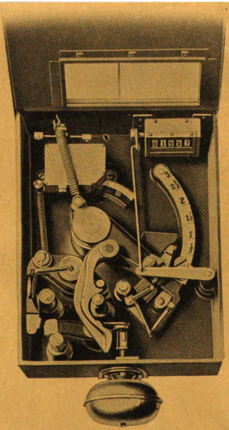


Figure 26.- The Koehring Batchmeter.

method is far better than none at all.

The Koehring people have developed a similar batch timer as the Jaeger Company and have improved upon it to the extent that it locks the drum during the given mixing time. As the charge enters the drum the discharge chute is automatically, locked and remains so until the set time has elapsed, when the lock is released and at the same a gong sounding. (Figure 26.) In this system the operator must wait until the mix is ready before he can discharge it.

The Multifoote batchometer is a gear driven devise by which the revolutions of the drum controlling the time of the mix. Like the Koehring it locks the discharge chute during the predetermined mixing period and then rings a gong that signals the operator that the batch is ready to be discharge. (Figure 27.) This system is not so good because the drum may be run faster or slower there by changing the mixing time which is the important factor.

The Knickerbocker machine is equipped with a batchmeter very near like the Koehring. This type is the best that has so far been developed, because no choice is left to the operator as to the time of the mix.

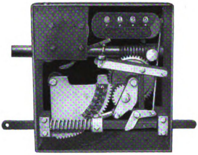
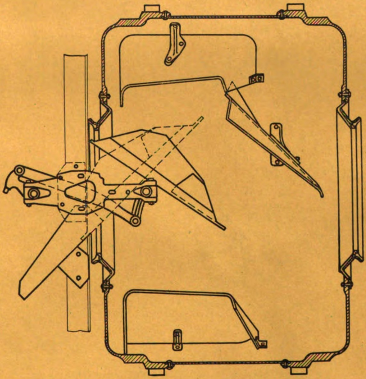


Fig. 39 — The MultiFoote "pacemaker." It signals the operator when the batch is ready for discharging.

Figure 27.- The Multifoote Batchometer.



The above illustration shows how the Koehring discharge chute is pivoted inside the drum. The heavy line drawing shows the position of chute in reverse positon when forming part of the mixing action. The dotted line shows its position when elevated to discharge, forming a continuous chute with the outside stationary end of the chute. Note how inside section in reverse position returns the material to charging side of the drum for repeated trips through the mixing action and how the discharging position offers a big area to receive the concrete poured into it by the pick-up buckets.

Figure 28.- Showing the positions of the Koehring discharge chute.

DISCHARGE CHUTE

The discharge chute is an important item in the design of a concrete mixer. It may save a lot of time in the unloading of the drum if properly designed or may delay the unloading if constructed incorrectly. Also in some of the above machines it plays an important part in the mixing action of the drum.

The Jaeger people do not have a discharge chute since their tilting drum discharges direct. This method is the fastest of them all but is likely to discharge the larger materials first there by causing seggregation.

A straight chute pivoted on the inside is used by the Koehring Company on their machines. (Figure 28.) This chute in the reverse position aids in the mixing action of the drum. It is a hand operated chute which makes it slower than the power type.

The Multifoote employ a power driven rotary chute. (Figure 29.) The chute is built of one piece and therefore, very stable. The rotary design has few advantages over the other types.

Extremely large straight chutes are used on the Oshkosh and the Knickerbocker machines. This feature makes the discharge action fast. The Oshkosh employ a power driven chute which also helps to speed up the discharge operation. (Figure 30.)

The Ransome and the Rex companies have developed discharge chute built in two parts. (Figure 31.) This breaking down chute allows the mixer to be placed nearer the tower.

This feature may be an important item on some jobs, but has no advantage other than this.

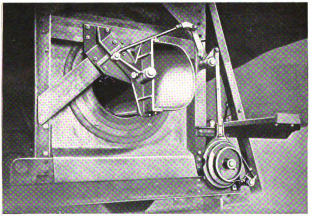


Fig. 29—A quarter turn rotates the trough into non-discharging position.

Figure 29.- The Multifoote power driven rotary chute.

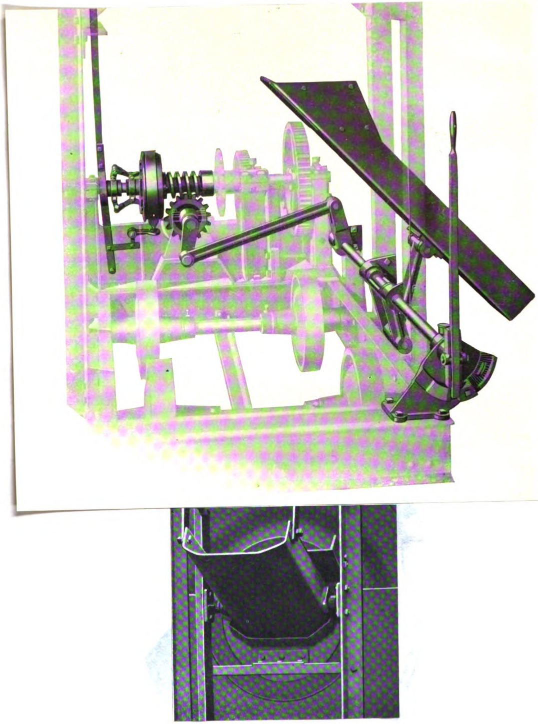
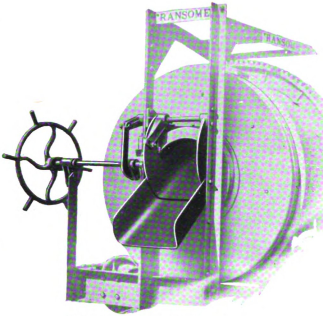
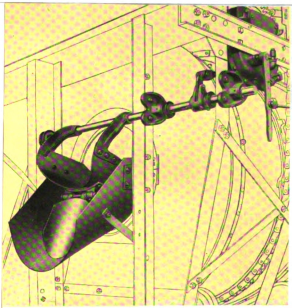


Figure 30.- Above the Oshkosh power driven straight chute. Below the Knickerbocker straight chute, Note the extremely large design.



RANSOME DISCHARGE CHUTE—OPEN



The Rex chute is pivoted outside the drum—there ar
no supports to restrict the drum opening.

Figure 31.- Above the Ransome two piece chute.

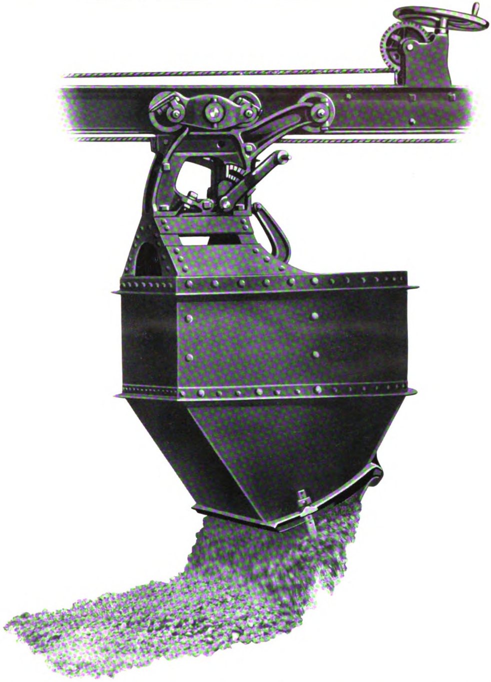
Below the Rex power driven two piece chute.

BOOM AND BUCKET.

In the pavers the boom and bucket play a major part in the handling and spreading of the concrete. The companies who build pavers have realized this and have developed efficient boom and buckets for their machines.

Very little difference appears in the five makes of machines mentioned in the outline, except in the minor details. The one important difference is that the Jaeger people operate their bucket by hand while the others control theirs by power. They say that the men around the mixer who are spreading the concrete know just where they want the next batch to go and can put it there better than the operator. This is true but an extra man is needed to operate the boom and bucket. In the other case the operator can do it very satisfactory himself.

All of them use the self spreading bucket with either one or two doors. (Figure 32.). There is very little difference between them, all type being equally good.



The Koehring self-spreading bucket eliminates a large part of the work of spreading concrete. The bucket opens automatically when suddenly stopped at any point on the boom—although bucket may be slowly stopped without opening the door.

Figure 32.- A typical self-spreading bucket.

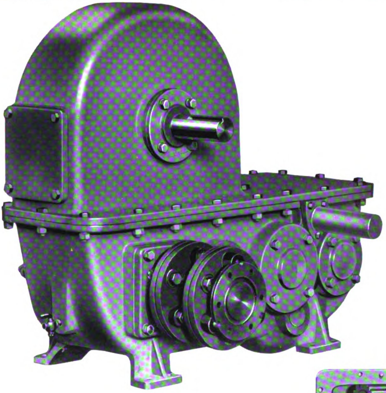
TRANSMISSION AND POWER PLANT.

One of the most important major improvements made in the construction of concrete mixers, in recent years, has been the grouping together of the high speed gears into one unit and isolating them from the destructive wear caused by dirt, grim, and other foreign materials lodging in the precision gearing. Three of the companies have taken this step and installed in their machines an improved form of counter shaft enclosed in a gear box and running in oil. (Figure 33.) They have also equipped all the bearing surfaces with roller bearings so that the maximum amount of power is delivered to the drum with the least loss by friction. These improved transmissions have been designed and perfected until today they are highly efficient.

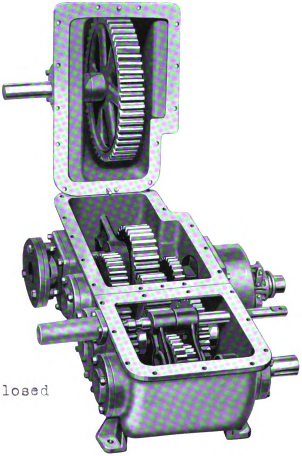
The remainder of the companies still use the old type of countershaft running out in the dirt and dust that is always found around the mixer. They are very inefficient and show poor design in this age of machinery. (Figure 34.)

The mixer may be of the very best design in every detail and still be useless if its form of power is independable. The outstanding requirements of the engine are that it must deliver a sufficient amount of power at all times, at a low cost, and must be dependable. The engine that will do this at the lowest cost is the best.

Most of the companies use the Le Roi engine on their small machines which have proven very successful, running day in and dayout with little attention. On the larger types some standard make of four or six cylinder engines are



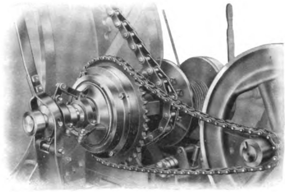
The 27-E gear case closed. This view shows the flexible coupling and drum drive shaft. Two covers, easily removable, make inspection easy.



The 27-E gear case open, showing the speed reducing, drum drive and traction speed change gears. All units are easily accessible; any shaft may be removed without disturbing the alignment of any gears.

Figure 33.- A typical closed gear box.

used. Through constant use these power plants have most all proven to be good.



COUNTERSHAFT, CLUTCH, HOIST DRUM AND DRIVING MECHANISM.

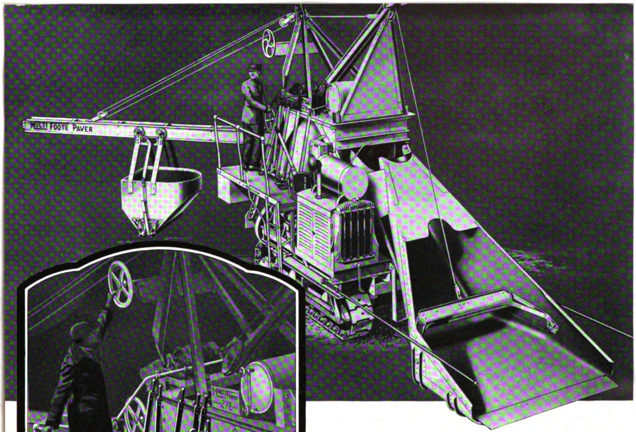
Figure 34.- A typical open countershaft.

CONTROL

The system of control of a mixer governs the speed of operation and therefore the output of the machine. The Rex people are the only ones who have tried to make the control entirely automatic. They have developed and patented a devise known as The Mechanical Man which controls practically all the operations gone through in running a batch. (Figure 55.) As the batchmeter bell rings, the operator throws the lever of the Mechanical Man. The discharge is opened. The skip automatically starts on its upward journey. Just as it reaches the top, the discharge chute is closed and the water turned on. All of this is done by the Mechanical Man. All the operator has to do then is to lower the skip, run the bucket out, if on a paver, and then wait on the next bell. This system makes everything absolutely automatic which allows a great over lapping of operations and saving of time.

The other companies have grouped their levers so that the maximum efficiency can be obtained by hand but nevertheless is slow compared to the mechanical method described above. (Figure 56.)

Figure 35.- Showing the mechantical control.



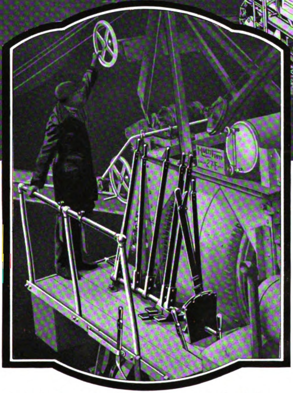


Fig. 37—On the "working deck" of the MultiFoote, the operator has a clear view of everything there is to do. All levers are banked within arm's reach.

Figure 36.- A typical hand control system.

In the next few years, millions of cubic yards of concrete will be made and put into roads, buildings, and other structures. It is hard to say which one of the mixers that are now upon the market is the best fitted in construction and design to produce this concrete and have it in its most durable form. The problem that confronts the buyer is to pick the machine that will give him the highest quality of concrete at the most economical cost.

The nearest approach to an ideal mixer would be a machine built of the best designed parts of all the mixers described above. If such a machine could be built it would probably be constructed like this:

The frame would be built of structural steel, hot riveted together, and so designed that it would withstand all the strains set up in the mixer. It would be mounted on solid axles, supported by roller bearing equipped wheels. The three point suspension method being used.

Trunions made of chilled car wheel steel and mounted on Timken tapered roller bearings would support the drum. The drum itself would be made of two cone shaped cast steel ends held together by a steel band. The blades and buckets inside the drum should be so designed that the five phase mixing action would be developed in the mixing chamber. The mouth of the drum would be made large so that an extra large, power operated, one piece discharge chute would be employed. Double ring pinion gears drive the drum.

The skip would be of stream line design elevated by two cables to a high angle for discharge. Attached to the ship for shaking it would be installed one of the Jaeger's Automatic Ship Shakers.

The water control tank would be one of the syphon three way valve type such as is used on the Koehring machines. The Koehring batchometer would also be employed because this device is time controlled and locks the discharge chute during the mixing time.

A roller bearing equipped transmission enclosed in a gear box with all gears running in oil would be installed to deliver the power supplied by some standard type of combustion engine. For control the Rex patented Mechanical Man would be used.

I believe that this construction would be superior to any of the types in the above outline for the best parts of all of them would be taken to build it. The ones that comes nearest to these specifications are the Koehring, the Multifoote, and the Rex mixers. The Koehring differ in that they do not use the Mechanical man for automatic control. The Multifoote mixer is also hand controlled because of the Rex patent. The Rex people do not instal a batchmeter on their machines. The remainder of the companies fall short of this type in two or more parts of their designs as shown by the outline.

In the next few years I believe that a much better grade of concrete will be obtained because the companies building mixers are realizing the inefficiency of their machines and are striving to always improve them.