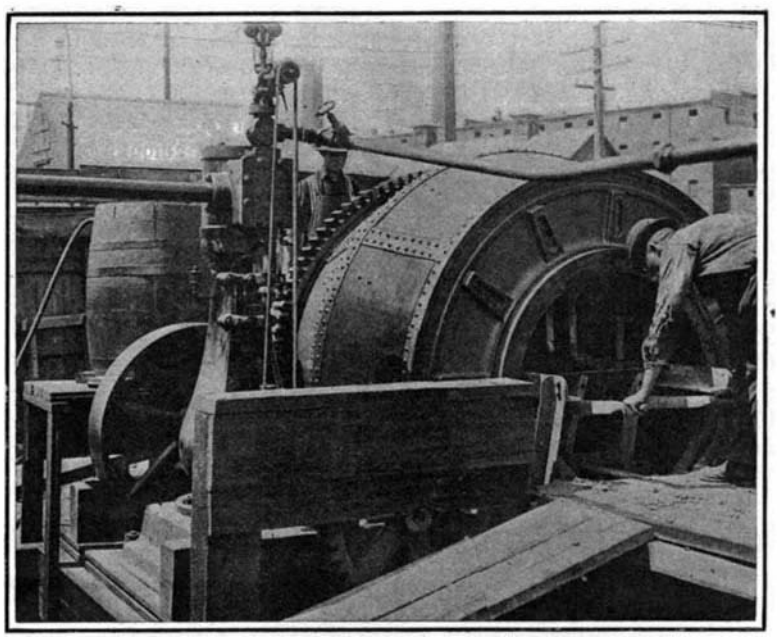
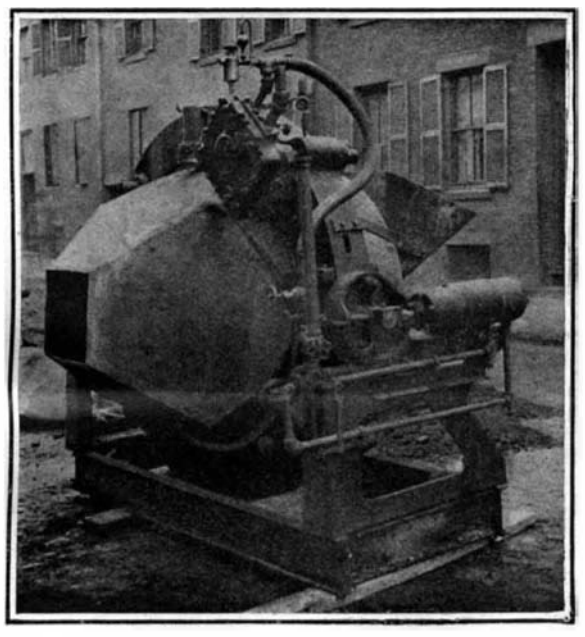
CONCRETE MIXING MACHINERY.

In the making of concrete, everything depends upon the thorough mixing of the component materials. The proportions of cement, sand, and stone vary, of course, with different conditions; but whatever they may be, it is important that there be enough sand to fill in the interstices between the stones, and that there be enough cement to fill in all the interstices between the grains of sand. Care should, therefore, be taken to coat each grain of sand with a layer of wet cement and each stone with a layer of this mortar. Concrete when properly made is of an even gray color, showing a perfect mixture and uniform coating of the sand and stones. This theoretical perfection of mixing is very closely approximated in large quantities of concrete by the use of special mixing machines. The first machine for performing this class of work was constructed on the lines of the brickmaker's pug mill—that is, the mill used for mixing and breaking up lumps of clay. This is mentioned in Hunt's "Dictionary of Arts, Manufactures, and Mines" of 1875. The next development was the trough mixer, consisting of a trough adapted to receive measured quantities of cement, sand, and aggregates, and a series of paddles adapted to mix the materials in the trough and move them toward the discharging end. Following the trough mixer came the cube mixer, an excellent machine which still survives. It consists of a



Gilbreth Machine Discharging Into a Wheelbarrow.



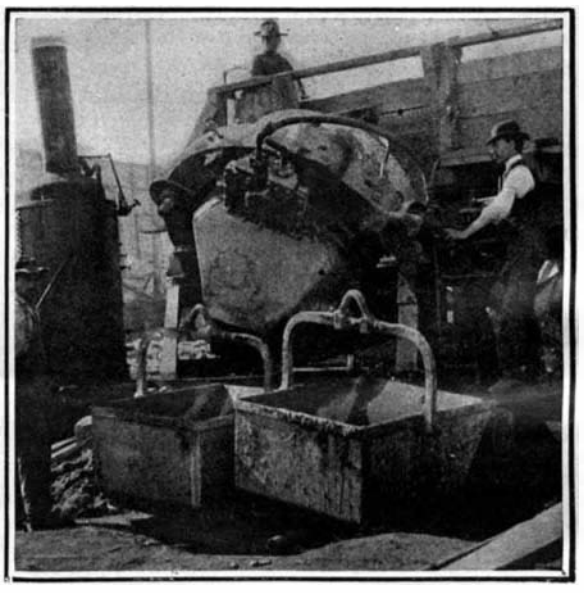
United Concrete-Mixing Machine in Mixing Position.

cubical box of sheet steel with bearings at opposite corners and turning on a horizontal axis. A trap door at one side serves to admit the materials, which are thereupon thoroughly mixed by rotating the box.

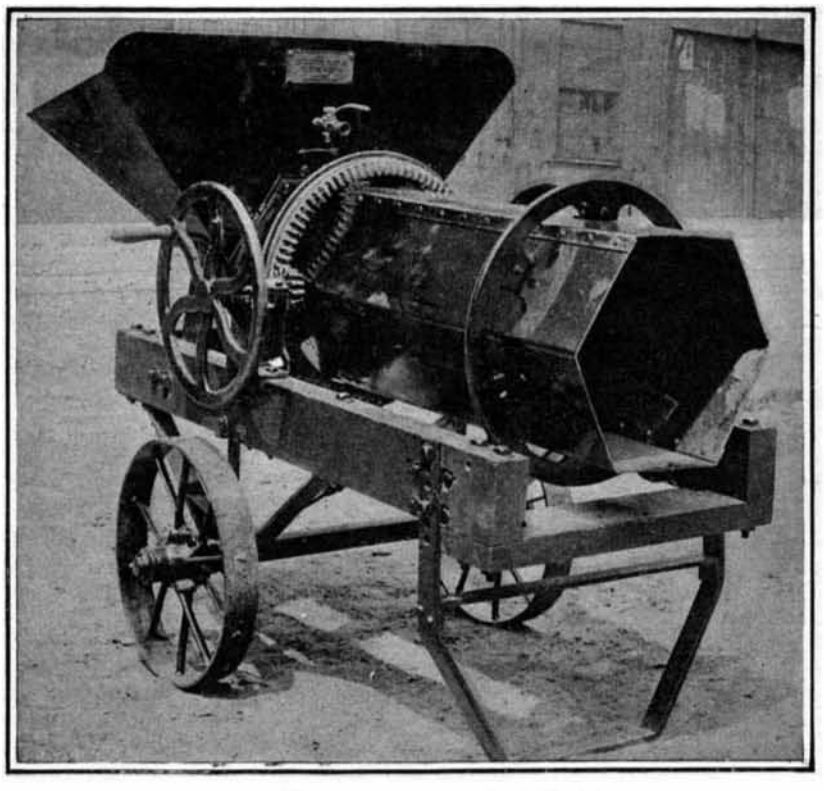
The cube mixer belongs to that class of concrete mixing machines known as "batch" mixers, in which the concrete is made in separate measured quantities or batches, as distinguished from "continuous" mixers, which are continuously discharging mixed concrete at one end while being fed at the other. To the latter class belongs the trough mixer, which is still used to a limited extent. The gravity mixer, also of this class, was invented by Mr. Frank B. Gilbreth some years ago to meet special requirements. Having a concrete foundation to lay, it occurred to him it might be a good idea to set up an inclined chute leading from the street to the bottom of the excavation, and by means of a series of spikes in the chute to effect the mixing of the cement and aggregates shoveled in at the top of the chute. The experiment proved quite satisfactory, and led to the development of the portable gravity mixer, which has been quite extensively used. It is evident that the mixture of materials in a machine of this sort is largely a matter of chance, and for this reason the gravity mixer is most useful for massive foundations and similar large and heavy work in which, owing to the vast proportions of the work, occasional defects in the quality of the concrete can be ignored.

Another of the "continuous" type of mixers is the hand power machine, which is illustrated herewith. It has a long hexagonal body open at one end, and at the other it is fitted over a fixed hopper through which the materials are poured in. The body is geared to be rotated by hand, and contains a series of blades secured to the side walls. The blades are set at an angle with the axis of the mixer, and serve to feed the materials from the hopper to the open end. Mixers of this type are very useful for small work, such as concrete block making.

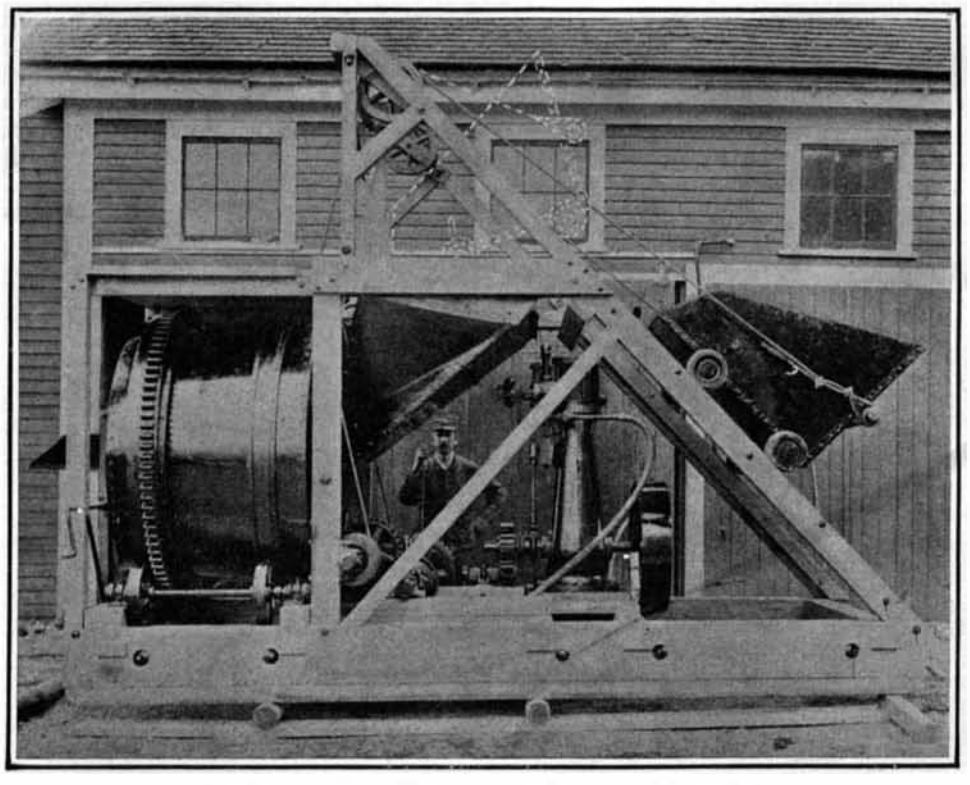
In this country a decided preference is shown for concrete mixers of the "batch" type, and this because it is next to impossible to thoroughly mix materials that are continuously moving forward. Mixing them by batches is a much more logical process, because the materials can be turned over and over and tumbled about until there can be no doubt of an intimate mixing. Many varieties of batch mixers are now in use. The first of these to comprised a rotary cylinder or drum, provided at one end with an opening to receive the batch and with an opening at the other end to discharge it. An excellent illustration of this type of mixer is to be found in the accompanying engraving of a "Ransome" machine. The illustration shows the drum partly broken away to indicate the peculiar arrangement of the vanes within. The circular wall of the drum is ribbed with a series of narrow steel plates or scoops, which extend diagonally from end to end of the drum, with a sharp upward bend near the front head of the drum. Riveted to each of these scoops near the bend is a blade or slide, which extends at a tangent thereto and its outer end rests on the edge of the next adjacent scoop. The machine reproduces the manual method of mixing the materials, namely, that of lifting them with a shovel and turning them over. Each scoop serves as a shovel, lifting up a portion of the batch, and owing to the diagonal set of the plate causing the material to slide toward the front or discharge end of the machine. Then, as the scoop nears the top of its orbit, it pours out the material onto the slide, which conveys it back to its starting point at the mouth of the drum. A thorough commingling of materials is thus insured. When, in a few moments, the concrete is properly mixed, the attendant operates the lever shown to the right in our illustration, lowering the discharging chute. The inner end of this chute catches the material poured out of the scoops, and conveys it out of the drum to the wheelbarrow, car, or bucket. The great advantage of this form of discharge over that of the "tipping" mixers is that it does not require a high working platform for the machine, because, as the chute is fed from the top of the drum, its lower end will be high enough to clear the wheelbarrow or



United Concrete-Mixing Machine Discharging a Batch of Concrete.



Hand-Power Concrete-Mixing Machine.



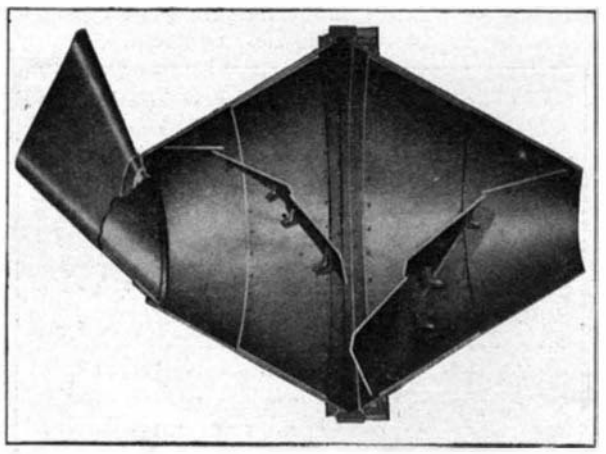
Gotham Mixer Equipped With Loading Mechanism.

CONCRETE MIXING MACHINERY.

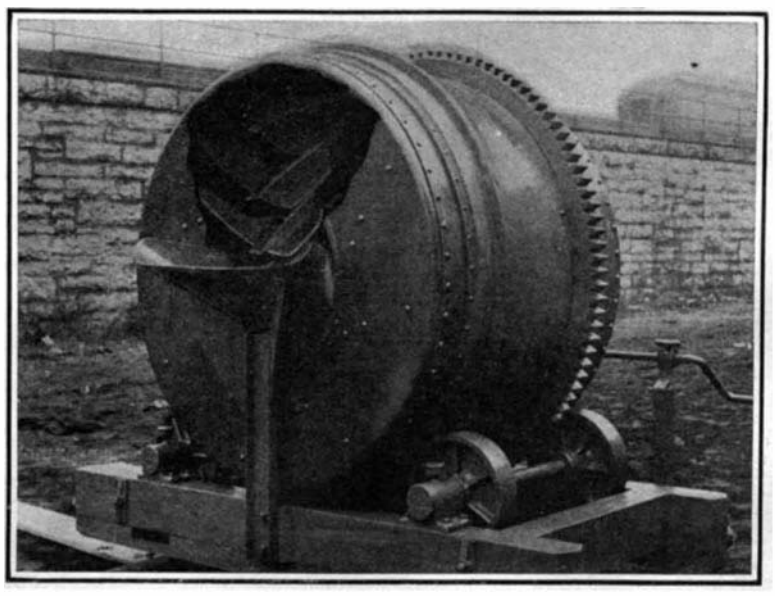
other receptacle used. The drum rotates continuously, both when discharging and when being charged, at a rate of about fifteen revolutions per minute. It turns on four rollers. One of the roller shafts is fitted with a driving pulley, and also with a pinion which meshes with a gear ring on the drum and causes the latter to rotate.

Another interesting concrete mixer of the same type is the "Gilbreth rotary." This machine is unique in that it can be loaded or discharged from either or both ends. The openings in the opposite heads of the drum are large enough to admit a wheelbarrow, as pictured in our illustration. Within the drum is a stationary framework carrying a pair of rails, which serve as guides for the wheelbarrow. This framing also carries a set of "coating tables." The aggregates and the cement are picked up by scoops and cast violently against these stationary coating tables. After proper mixing a wheelbarrow is placed in the machine, and it receives the concrete as it pours out of the scoops. If desired, a chute can be used in place of a wheelbarrow, both for charging and discharging the machine. The "United" mixer, which is shown in two of our engravings, illustrates a different system of discharging the batch. The machine belongs to the "tipping" class, the mixing chamber being so mounted that it can be tipped up to discharge its contents. The mixing chamber is in shape of a drum formed with a large pyramidal chute or spout at its discharge end. The drum is mounted to revolve in a ring, which in turn is designed to rotate on an axis in the same plane as, but at right angles to, that of the drum. Mounted on this ring is an engine of the square piston type, which drives the drum directly by means of spur gearing. Steam is fed to this engine through a flexible tube. This direct system of drive does away with a lot of complicated mechanism, which would be necessary were the machine operated by a stationary engine. Steam power is also used for tipping the drum. As shown in one of our illustrations, the rocking support of a ring frame consists of a pair of mutilated spur gears secured thereto, one at each side, and engaging horizontal racks on the main frame of the machine. Connected by a pitman with the axis of the spur gear is a piston, which works in a steam cylinder on the main frame. The piston has three positions, one for charging, the second for mixing, and the third for discharging. When the piston is moved to its extreme rearward position, it draws the entire ring frame and mixing drum back, causing them to tip back slightly. This lowers the charging chute, so that the materials can be more easily fed into the drum. The intermediate position of the piston carries the drum back to the horizontal, which is maintained until the materials have been properly mixed, when the piston is driven to the extreme forward end of its stroke, tipping the drum down, and permitting its contents to pour out. The machine can, of course, be charged when in its mixing position if conditions permit of hauling the stone and sand to a sufficient height above the drum.

One of the simplest machines of the tipping class is the "Smith" mixer. The mixing chamber of this machine consists of two truncated cones, with their larger ends joined together and their smaller ends open. In one end a chute is fitted, by means of which material is fed into the mixing chamber. Within this chamber are a series of blades which project radially inward. One of our illustrations shows a longitudinal section of a Smith mixer, and indicates the form and position of the blades. It will be observed that they follow the general outline of a spiral screw thread, and are adapted to carry the material from the center of the chamber toward the ends. The thread, however, is not continuous, and as the drum revolves, the material drops through the gaps between the blades, and slides down the inclined conical walls to the center of the chamber. The arrangement of the blades and the conical form of the drum are excellent, not only because they insure a thorough stirring and mixing of the batch, but also because there are no corners or pockets in the mixing chamber which would be liable to be clogged. When the batch is mixed, the drum is tipped up and the materials are poured out. The drum is mounted to turn on rollers in a swinging frame, the latter being journaled to a fixed frame. The driving mechanism comprises a pair of miter gears, one keyed to one of the axles of the swinging frame, and the other carried by the swinging frame. Secured to the shaft on which the latter bevel gear is mounted is a small spur pinion that meshes with the gear ring on the mixing drum. Power is transmitted to the mechanism by a driving pulley. The drum is tipped manually by depressing a lever secured to the axle at the opposite side of the machine.



Section of Smith Machine Showing Spiral Blading.



Ransome Machine Broken Away to Show Arrangement of Scoops.

Intimately connected with the subject of concrete mixers is the question of measuring out the materials, and delivering them to the mixing drum in an economical manner. Too little attention is paid to this question, and the majority of plants will be found to be working under most uneconomical conditions. A small mixer properly equipped with means for measuring out the batches and for expeditiously supplying them to the mixing drum will turn out twice as much work as the large machine operated in the usual wasteful manner. One of our illustrations shows a small plant comprising a "Gotham" mixer, driving engine and charging car. The car travels up a pair of inclined rails to a position above the mixer, where it tips (as indicated by dotted lines in the engraving) and pours its load into the charging chute of the machine. The car is large enough to contain a batch, and is loaded while the previous charge is being mixed. Instead of shoveling stone and sand into a waiting machine, the shoveling is done into the car while the machine is at work, and then dumped into the mixing drum as soon as the latter is emptied without the loss of a moment, thus making both the loading and mixing practically continuous. For very large work a more elaborate equipment is necessary. We illustrate herewith a very complete plant used in laying the concrete foundations of a large gasometer. A tower is built at the edge of the excavation, and at the top of this tower there are two bins, one for stone and the other for sand. The bins are supplied by a belt conveyor, which feeds either stone or sand as desired, a chute being used when filling the sand bin to carry the material past the stone bin. Owing to limits of space at this particular plant, the stone and sand must be dumped in stock piles at a short distance from the conveyor, and then hauled to the conveyor in wheelbarrows. Just below the bins is the measuring platform, on which the measuring hopper is placed. This has a compartment of measured size for sand, and another for stone. Spouts from the bins above lead respectively to these compartments, and to measure out enough stone and sand for a batch, the operator needs but to open the gates of these spouts, letting the materials pour into the measuring hopper until the compartments are filled. Another gate is then opened to permit the measures of sand and stone to slide through a chute into the mixer below, and at the same time the cement and water is poured in. No measure is required for the cement, as it comes in bags of a measured size, and it is merely necessary to throw in one, two, or three bags, as the case may be. Each bag contains one cubic foot of cement, and it serves as a basis among some manufacturers for rating their mixing machines, as the size of the batch, of course, depends upon the quantity of cement used. A "Smith" mixer is used in the plant just described, and as soon as the concrete is thoroughly mixed, the machine is tipped up to pour the material into cars, which are run on tracks to any desired part of the foundation. The entire plant is an excellent example of practical economy with the exception, perhaps, that no convenient storage bin is provided for the cement, and it must be hauled by laborers from the cement shed to the measuring platform.

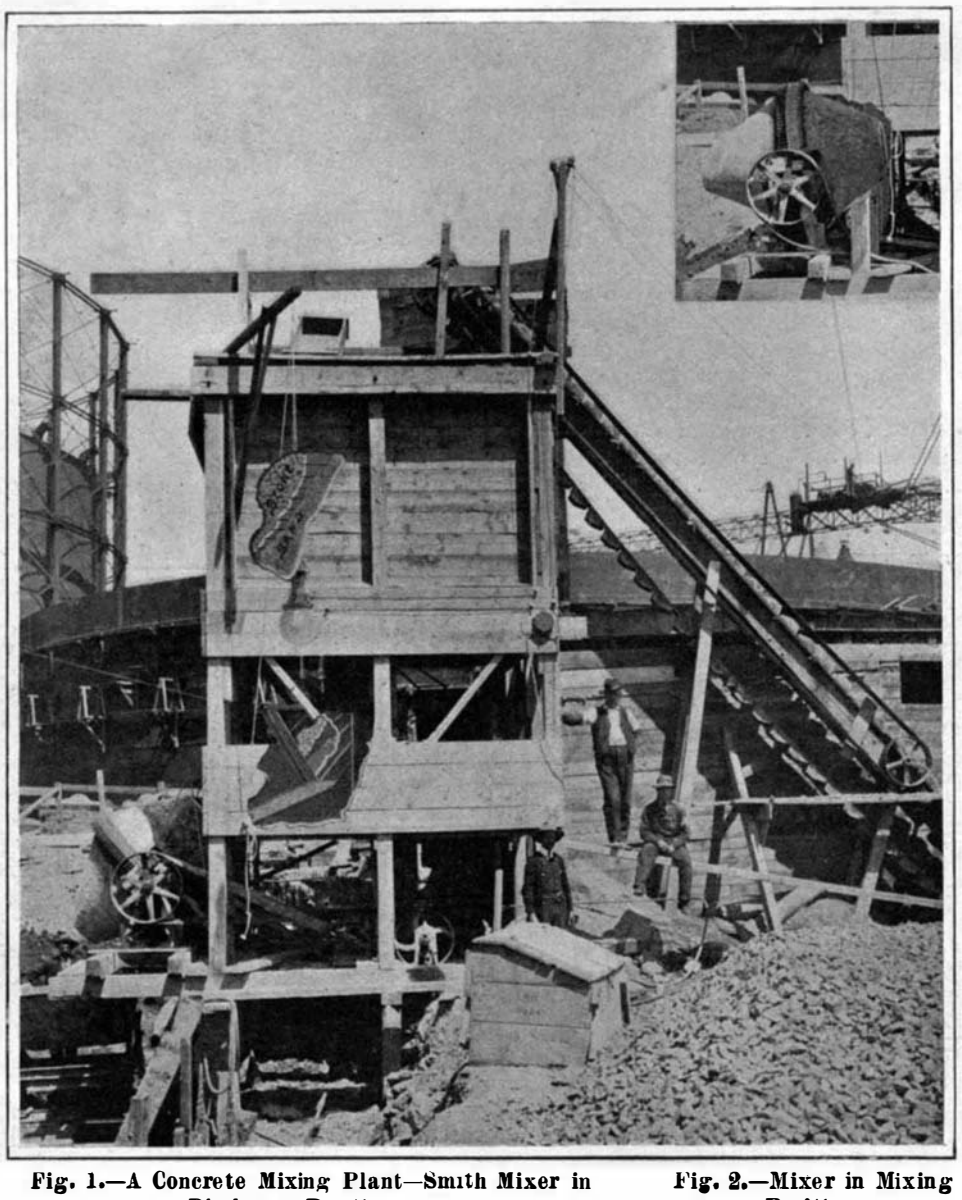


Fig. 1.—A Concrete Mixing Plant—Smith Mixer in Discharge Position.

Fig. 2.—Mixer in Mixing Position.

CONCRETE MIXING MACHINERY.

Linoleum for Cement Floors.

To make linoleum adhere to a cement floor, a glue is used which has been boiled until it is of the consistency of carpenters' glue, and to which sifted wood ashes have been added, stirring, to make a mass resembling varnish. Apply to the lower side of the linoleum, and press hard against the floor.—Die Werkstatt.