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C. WESTPHAL ET AL

METHOD OF BUILDING WITH CONCRETE OR THE LIKE AND APPARATUS THEREFOR

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Fig. 2

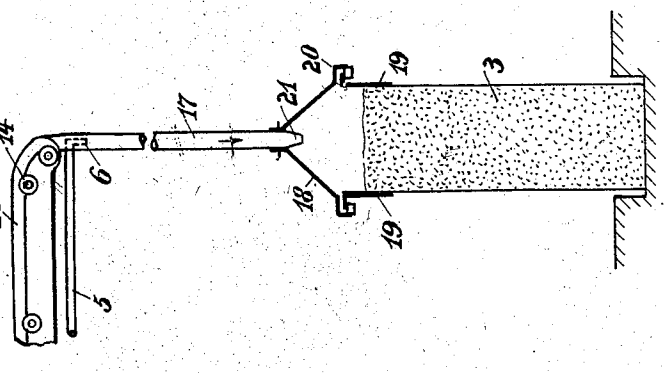
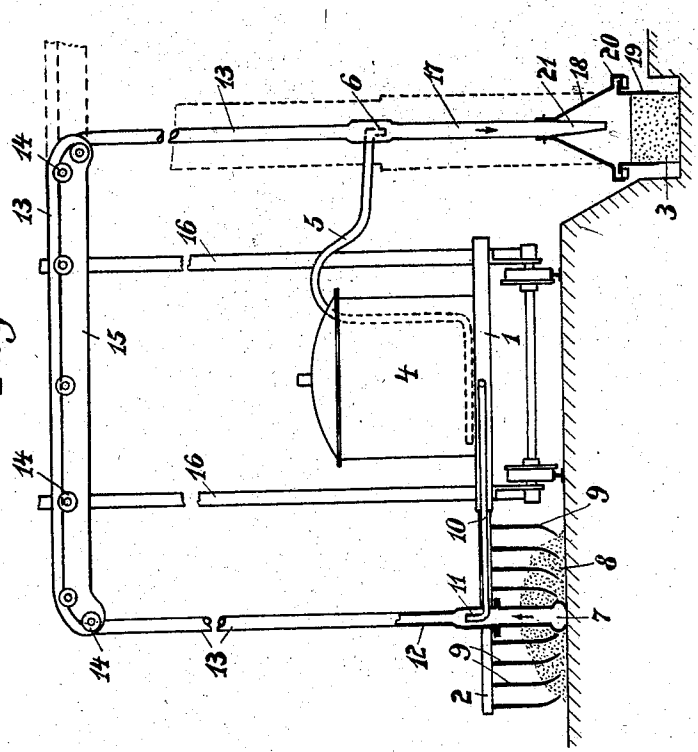


Fig. 1



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METHOD OF BUILDING WITH CONCRETE OR THE LIKE AND APPARATUS THEREFOR.

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The present invention relates to methods of building, in which the masses of mortar, or the like, are conveyed, under gaseous pressure, through pipes to the place or point where they are used, or where they are deposited, and set between suitable shutterings.

The main object of the present invention is to prevent the cement and aggregate setting in the conveying pipes, and a further object is to accomplish the delivery of the cement and aggregate ready for setting in the shortest space of time by eliminating the previous act of moistening the additional substances, though at the same time supplying the necessary moisture.

Another object is to arrange the admixture of the cement with the damp aggregate so that setting cannot occur until the mortar so formed is delivered in desired position.

Another object is to assure delivery of the cement and aggregate between the shuttering boards irrespective of the thickness of the wall being built.

A process according to the present invention is characterized by the fact that the additional substances added to the mortar, such as sand, gravel, or slag, hereafter termed "aggregate", are conveyed to the place where they are to be used in a moist state in a separate pipe from that used for the cement, by means of compressed air or steam at a sufficiently high pressure, while the dry binding agent, such as lime, or cement, is conveyed in a dry state to the additional substances before it issues, or as it issues from this pipe, so that a mixture of mortar ready to set is deposited at the place where it is to be used.

Whereas when compressed air is used as the conveying medium the aggregate has to be moistened to a suitable degree prior to it being mixed with the binding agent, this moistening is not required when steam is used. In this case, the aggregate takes up sufficient moisture from the steam as it is being conveyed; furthermore, the mixture is warmed by the heat of the steam, so that a more complete and more rapid setting thereof is obtained.

As according to this method no ready prepared mixture of mortar liable to set is conveyed through the long pipe, it is obvious that no incrustation of the walls of the pipe consequent upon premature setting, and no stoppage of the pipes and therefore breakdown in working can take place.

In the accompanying diagrammatic drawing is shown, by way of example, a preferred constructional form of an apparatus embodying the present invention.

Figs. 1 and 2 show this apparatus in general view and with the place where the mortar is delivered at both low and high levels.

On a travelling framework 1 is mounted a frame 15, 16 in which is carried a pipe system including the conveyor pipe 13 adapted to be moved on rollers 14. The receptacle 4 for the binding agent, the lime or cement, may also be conveniently mounted on this travelling frame 1. From the receptacle 4 a pipe 5 leads to the conveyor pipe 13, into which it projects by a mouthpiece 6. The pipe 13 is carried on in a straight line after the entrance of the binding agent pipe.

This straight part 17 of the conveyor pipe which terminates in an interchangeable outlet nozzle, forms the mixing chamber, in which the moist aggregate combines with the dry binding agent.

The length of this mixing chamber (the portion 17 of the pipe) may be any that may be desired, but it will conveniently be made dependent on adequate mixing of the materials being ensured, so as to obtain a mortar at the point of delivery which is ready for use and capable of setting. The outlet nozzle 21 may also be longer or shorter as may be required, according to the desired form which the cone of the issuing mass of mortar is to possess. To this outlet nozzle 21 is removably attached a hopper or funnel-shaped vessel 18 called a spraying box. It is provided at the lower end of its opening with gripper arms 20 provided with anti-friction rollers, or the like, which catch under the turned over upper edge of the shuttering bars 19 and therefore support them.

Into the other end of the conveyor pipe 13 passes at 12 a supply pipe 10 for the pressure

medium used for conveying the pressure medium employed (compressed air or steam), being generated in an apparatus not shown in the drawing. The pressure medium flowing through the nozzle 11 draws through the suction pipe 7 the aggregate lying on the floor, carries it upwards, and conveys it through the pipe 13 to the outlet nozzle 21. An arm 2 mounted on the travelling frame is provided with prongs 9 which loosen the heap of aggregate and bring it up to the suction pipe 7.

In the example shown, one and the same current of pressure medium is used both for drawing up and conveying the aggregate, and for delivering the binding agent from the receptacle 4 through the pipe 5. Alternatively a separate second current of compressed air may be used for conveying the binding agent to the conveying pipe. With the described arrangement, the method would be carried out as follows:—

The framework will be run slowly along the excavated building trench, the additional materials such as the sand, gravel, or slag, which are piled up along the line of rails being drawn in by means of the pressure medium and delivered to the mixing chamber where the binding agent enters. The ready made mass of mortar issuing from the nozzle 21 deposits itself between the shuttering boards 19, which are held by the hopper 18 which travels along the top of them. At the end of the shuttering the framework is reversed so that the edge 3 of the wall gradually becomes higher by the layers of the mass of setting mortar deposited between the shuttering boards, which are suitably raised as the apparatus runs to and fro.

It is obvious that the apparatus used for carrying out the method herein described may be constructed of other shapes, and may contain elements which make the distance at which it acts, or its range of operations, independent of the movability of the frame which carries them.

We claim:

1. Method of building with concrete, consisting in separately delivering under gaseous pressure the aggregate in moist condition and cement in dry condition at the place where building is in operation.

2. The method of building with concrete which consists in conveying and delivering to a mixing chamber under pressure the aggregate in a moist condition and conveying and delivering to the mixing chamber cement in a dry condition, and then depositing the mixture from the mixing chamber in situ.

3. Method of building with concrete, consisting in separately delivering under pressure of steam, the aggregate and cement, to the place where building is in operation, the steam moistening the aggregate so that a mass of concrete ready for use is deposited in the shortest space of time.

4. Apparatus for use in building with concrete, comprising in combination a system of pipes for separate conveyance of the aggregate and cement, means for supplying gaseous pressure to the pipe system for delivery therethrough of the aggregate and cement, said pipe system being mounted for vertical and horizontal displacement, and means for effecting said displacement.

5. Apparatus for use in building with concrete, comprising in combination a system of pipes for separate conveyance of the aggregate and cement, means for supplying gaseous pressure to the pipe system for delivery therethrough of the aggregate and cement, said pipe system being carried on a travelling carriage, and means for displacing vertically said system on said carriage.

6. Apparatus for use in building with concrete, comprising the combination with a travelling carriage and a pipe system vertically displaceable thereon, of means for drawing the aggregate into the pipe system, a chamber terminating said system, an inlet for the cement to said chamber, and an extension to said chamber, the cement being drawn into the chamber and the extension acting as a mixing chamber for cement and aggregate.

7. Apparatus for use in building with concrete, comprising the combination with a travelling carriage and a pipe system vertically displaceable thereon, of means for drawing the aggregate into the pipe system, a chamber terminating said system, an inlet for the cement to said chamber, an extension to said chamber, the cement being drawn into the chamber and the extension acting as a mixing chamber for cement and aggregate, and a hopper on said extension, and claw members on the lower part of said hopper for engaging the shuttering boards of the building.

8. Apparatus for use in building with concrete comprising in combination with a travelling carriage, a conveyor pipe, a chamber near the inlet end thereof, an injector nozzle in said chamber, a pressure supply to said nozzle for drawing the aggregate into said pipe through the inlet end, a second chamber near the outlet end of the pipe, an inlet for dry cement in the second chamber, an extension thereto, the cement being drawn into said second chamber, and falling into the extension which forms a mixing chamber for the cement and aggregate, and means for mechanically gathering the aggregate to the inlet end of said pipe.

9. An apparatus of the character described including, in combination, a movable frame, a system of pipes supported on said frame communicating with a mixing chamber, said

mixing chamber terminating in a nozzle and a spraying box with which said nozzle communicates, all adapted to deposit the material in situ, said system of pipes being subjected to fluid pressure and having an inlet end to receive the aggregate, a receptacle for dry storage of the binding agent and a conduit connecting said receptacle with said pipe system adjacent said mixing chamber.

In testimony whereof they affix their signatures.

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