United States Patent [19]

Malan

[11] **3,845,631**

[45] **Nov. 5, 1974**

[54] **DAM BUILDING SYSTEM**

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[22] Filed: **Sept. 15, 1972**

[21] Appl. No.: **289,535**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 66,980, Aug. 26, 1970, abandoned.

[52] **U.S. Cl.** **61/30**

[51] **Int. Cl.** **E02b 7/04**

[58] **Field of Search** 61/30, 46, 46.5, 49, 63

[56] **References Cited**

UNITED STATES PATENTS

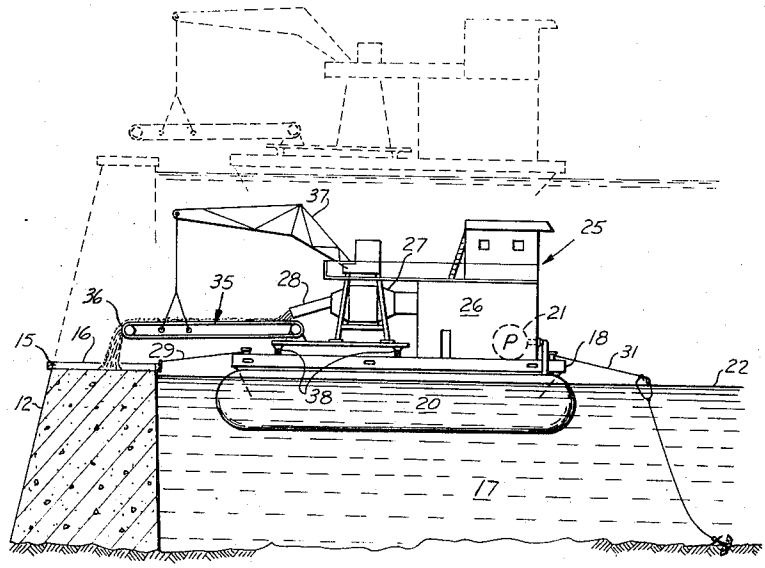
358,853	3/1887	Goodridge	61/30 X
808,800	1/1906	Wright	61/30 X
1,758,606	5/1930	Jacobs	61/46
3,314,239	4/1967	Baron et al.	61/46
3,495,409	2/1970	Riedemann	61/49 X
3,670,813	6/1972	Duncan	61/46.5 X

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[57] **ABSTRACT**

This invention relates to the building of dams by floating a concrete mixing plant in the pool formed upstream by the dam itself, and then discharging the concrete from the plant to the dam in a closely coupled system. By so doing, the limitations of the classical cableway, such as its sway and variable sag, are overcome, and concrete can be discharged at a rapid rate without segregation of its components. Means is shown for stabilizing the discharge mechanism of the plant so that variations in loads, winds, and orientation, will not cause a hazard to the laborers. Furthermore, the material may be kept cooler, which is a substantial advantage in the building of dams, by storing it, instead of on the hot side of the canyon or the top of the rim, in the shadows of the canyon near the water, and supplying the floating plant by means of a floatable conveyor. The temperature of the materials may be lowered by many degrees, thereby saving substantially on refrigeration costs. Potentially, this may even permit the building of dams in continuous pours, rather than in blocks which must be grouted together.

21 Claims, 11 Drawing Figures



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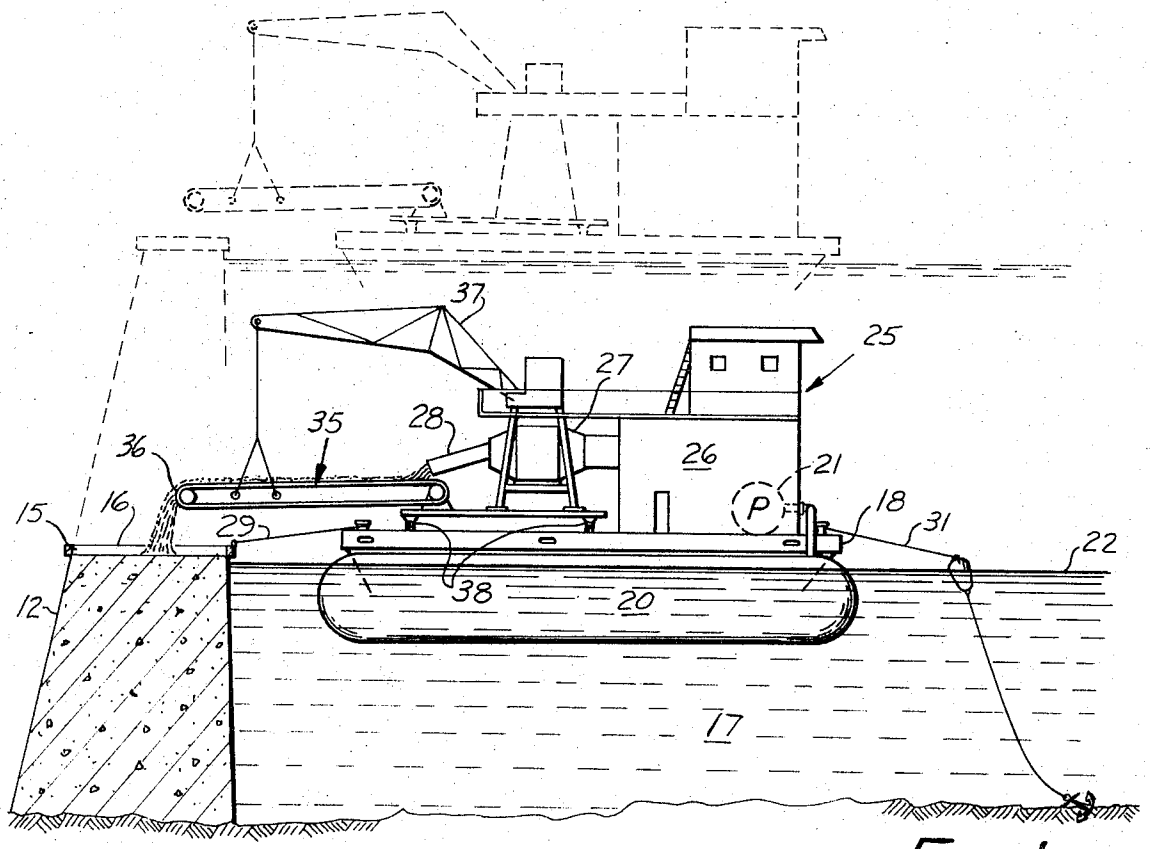


FIG. 1

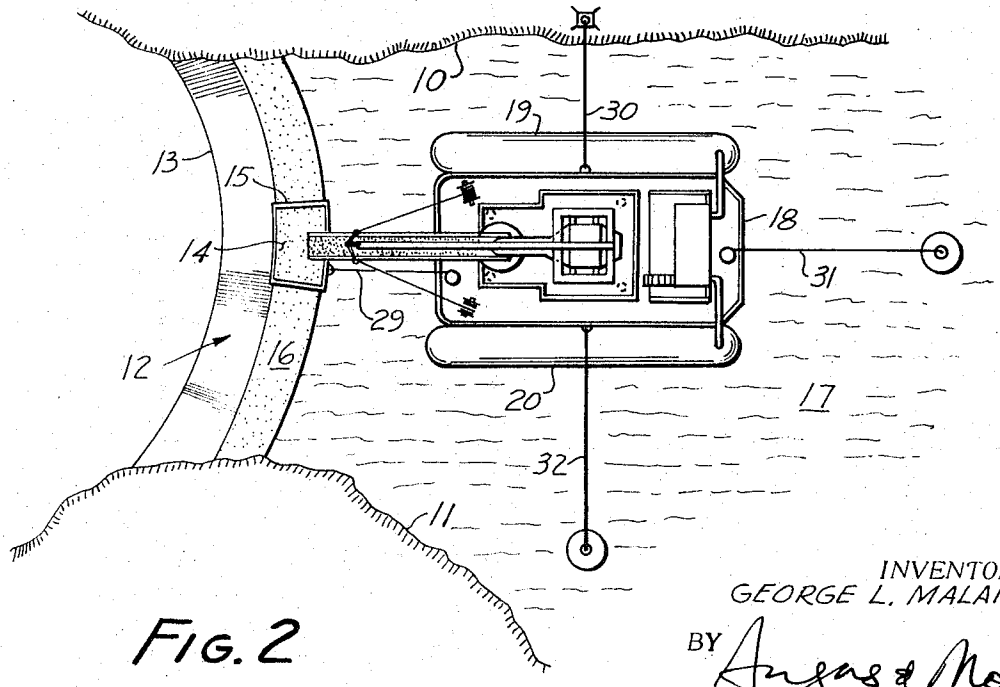
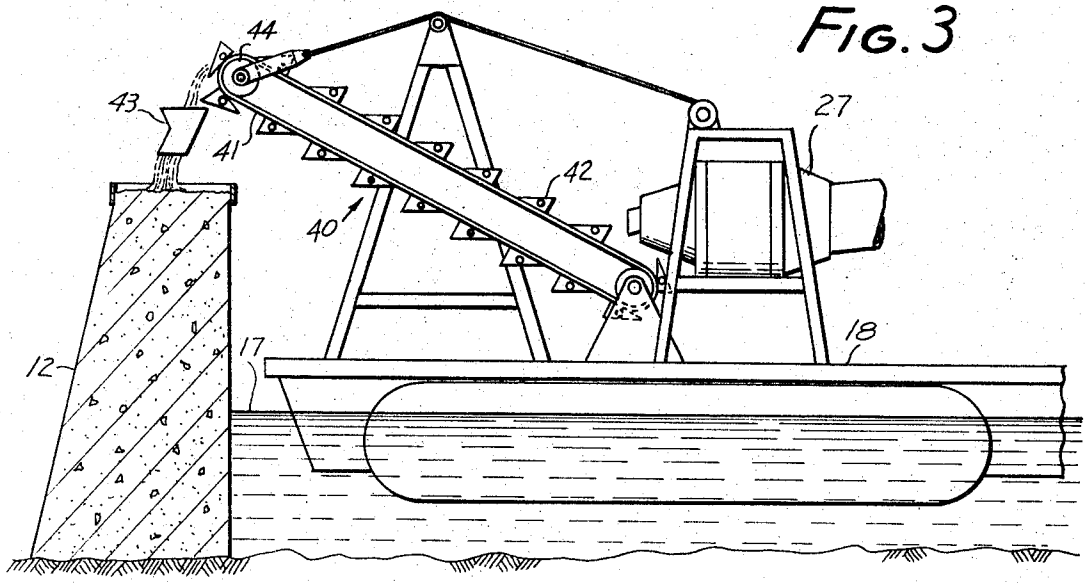


FIG. 2

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FIG. 3



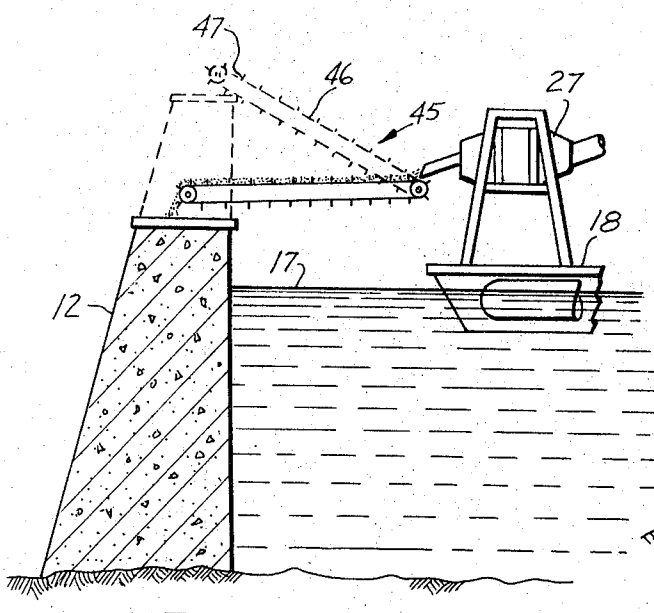
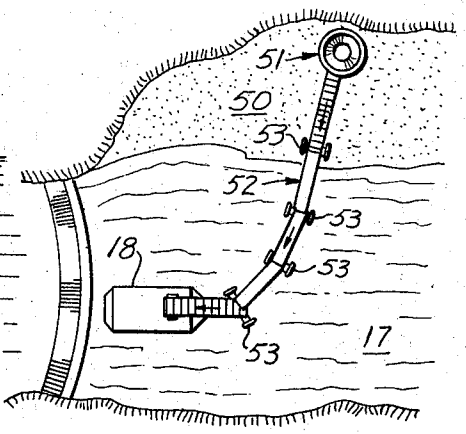


FIG. 4

FIG. 5



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DAM BUILDING SYSTEM

CROSS-REFERENCE TO CO-PENDING PATENT APPLICATION

This patent application is a continuation-in-part of applicant's co-pending United States patent application, Ser. No. 66,980, filed Aug. 26, 1970, entitled "Dam Building System", now abandoned.

This invention relates to a system for building a dam across a body of water and to a mechanical arrangement utilizing the system.

The classical technique for building a concrete dam is to build a mixing plant at the top edge of the canyon adjacent to a cableway, and then to carry the mixed concrete to the placement site in batch buckets. There are significant limitations on the use of cableways whose lengths are often very long and whose rises are very high. One is sway, which is a constant danger to workers, and which limits the use of the cableway system in high winds. Another is the variable sag of the cableway which depends on how far the bucket is laterally disposed from the edge of the canyon. Suffice it to say that utilization of cableways is very much an art, and would be avoided if there were reasonable alternatives.

Certain apparently reasonable substitutes for cableways prove to be unusable. For example, discharging concrete via chutes is not suitable, because the concrete will tend to segregate as it slides along the chute and is in an unusable condition by the time it reaches the placement site.

Still other problems arise with the use of known dam building techniques. One of them is derived from the problem that concrete has to be cooled. It is well known that the cooler the raw materials, and the cooler the wet unset concrete, the better the concrete will set up. Accordingly, it is not unusual to provide refrigeration systems, not only for the already poured concrete in the dam itself, but also for the raw materials from which the mixed concrete is made, i.e., the aggregate, concrete and water. This latter is provided to counteract the tendency of the sun and of the ambient air to heat the materials, especially when they are stored above the canyon. It is an object of this invention to provide means whereby cableways can be eliminated, whereby the concrete can be moved smoothly and without segregation to a placement site, and whereby the material can be stored in cool, convenient locations thereby to reduce the temperature of the mixed concrete to an acceptable temperature with a minimum of refrigeration, if any is needed at all.

The random movements of large pieces of equipment can constitute a serious hazard to laborers. This invention includes means to stabilize the location of the means which discharge the concrete to the dam site, so that even if the load on a conveyor varies widely, or if the extension and direction of a conveyor are changed, the discharge mechanism will be relatively stable, thereby protecting the men who are working near it.

A process according to this invention includes the steps of forming a pool upstream of the dam site, placing a floating platform bearing a concrete mixing plant in said pool, and discharging concrete from the mixing plant at a placement site on the damsite so as to build the dam and to increase its height. The pool is permitted to deepen as the dam rises so that the mixing plant approximately rises with the dam, whereby the concrete is mixed at a location relatively close to the placement site.

According to a preferred but optional feature of the invention, the platform is moved from side to side of the pool by positioning means so as to keep to a minimum the distance by which the concrete must be transported laterally along the top of the dam.

According to still another preferred but optional feature of the invention, the concrete is moved from the mixing plant to the placement site by conveyor means.

According to still another preferred but optional feature of the invention, a floatable conveyor is extended between the shoreline of the pool and the floating platform in order to supply materials to the concrete mixing plant, the floatable conveyor rising with the surface of the pool.

According to still another preferred but optional feature of the invention, stabilizing means is provided for the floating platform and/or for the free end of its discharge means.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is a side elevation, partly in cutaway cross-section, showing one embodiment of the invention;

FIG. 2 is a plan view of FIG. 1;

FIGS. 3 and 4 are side views, partly in cutaway cross-section, showing two modifications of the delivery system of FIG. 1;

FIG. 5 is a plan view showing means for conveying supplies to the concrete mixing plant of FIG. 1;

FIG. 6 is a fragmentary plan view of one of the steps in the process of building a dam with this invention;

FIG. 7 is a side view, partly in cutaway cross-section, taken at line 7—7 of FIG. 6;

FIG. 8 is a side elevation, partly in cutaway cross-section, of the presently-preferred embodiment of the invention;

FIG. 9 is a downward view of FIG. 8 taken a few degrees off the vertical;

FIG. 10 is a partial section view taken at line 10—10 of FIG. 9; and

FIG. 11 is a side view of a portion of FIG. 8.

FIGS. 1 and 2 show one embodiment of the invention. FIG. 2 is a plan view looking down on a damsite showing banks 10 and 11 of a stream of water, such as a river, which is to be blocked by a dam 12 at a damsite 13. A portion 14 (sometimes called a "placement site") is shown enclosed by forms 15 on the top 16 of the dam. It is the function of this invention to provide means to fill the forms sequentially and thereby to build the dam in known fashion.

The stream itself is the source of water for the pool, and it is permitted to form a pool 17 contiguous to the damsite. In this pool there is placed a floating platform 18. This floating platform may conveniently be supported on pontoons 19, 20 which, as will be more fully discussed later, may be connected to pumps 21 which can variably flood or evacuate them so as to change elevation of the platform relative to the surface 22 of the pool.

Atop the floating platform, there is disposed a conventional concrete mixing plant 25. The mixing plant has a control room 26, and a mixer 27 with a discharge spout 28. The materials for the concrete are conveyed

by means yet to be described directly to the floating platform, and the concrete is thereby mixed in a mixing plant closely adjacent to the dam.

As can best be seen in FIG. **2**, four positioning lines **29, 30, 31, 32** are provided which are attached to stationary means spaced from the floating platform, such as the dam, the shoreline, or buoys anchored in the pool. This arrangement permits the platform to be moved around the pool as desired. For example, by selectively pulling and releasing lines **30** and **32**, the floating platform may be moved back and forth laterally along the upstream face of the dam so as to minimize the distance that the concrete must be conveyed along the face. The four lines (or however many may be used), together with any means which might be provided for adjusting their lengths relative to one another so as to position the platform, are sometimes called "positioning means." Winches or the like may be provided to draw in or pay out the individual lines. Alternatively, they may be pulled in and let out by hand. Means for lengthening and shortening the positioning lines are therefore optional. Whatever the means, the result is adjustably to vary the relative lengths of lines **29-32** between the floating platform and respective stationary means.

A concrete conveyor means **35** receives the concrete from the mixing plant and discharges it to the placement site. In this specification, the term "concrete conveyor means" will be used to denote a powered device which continuously carries concrete in a substantially steady stream, either continuous or batched. It does have numerous variations. A V-shaped belt is shown in FIG. **1**, while in FIG. **3** a bucket chain is shown, and in FIG. **4** a clogged belt. Whatever is used, it is an objective of the concrete conveyor means to convey the concrete in such a manner that the concrete is not subjected to excessive shear forces such as would segregate it, as would be the case in sliding the concrete along a long chute. Protection against sliding may be provided by means such as by embracing the concrete closely with the concrete conveyor means, or by moving the concrete on an open concrete conveyor means along an angle of elevation not much above 30°, so as to minimize sliding of the concrete along the concrete conveyor means, or by moving it in minor batches. The concrete thereby arrives at the placement site in substantially the same condition as it left the mixing plant, and through the closely coupled system.

FIG. **1** shows that the elevation of the delivery end **36** of the conveyor may be varied by a crane **37** which can lift or lower the same.

Elevation adjustment means may be provided to vary the elevation of the mixing plant relative to the surface of the pool. One such means is the variable buoyancy of the pontoons as accomplished by pumps **21.** Another is a set of jacks **38** disposed between the floating platform and the mixing plant itself. By the usage of either of these, should the flow of water into the pool be insufficient to place the elevation of the mixing plant at a convenient elevation, then the elevation of the plant itself may be adjusted relative to the surface of the pool within reasonable limits. By this means, any change of elevation of concrete by the concrete conveyor means can be held within a suitable range.

FIG. **3** shows the mixing plant discharging to a concrete conveyor means **40** which includes a chain **41** with buckets **42** that discharge into a spout **43** at the delivery end **44.** This arrangement illustrates that the conveyor means may be a steady-state batch delivery means as well as a continuous-surfaced belt.

FIG. **4** shows concrete conveyor means **45** in the form of a belt **46** with clogs **47.** The clogs are transverse bars which restrain the sliding of the concrete along the belt, and divide it into small batches on the belt. It can move the concrete along a steeper slope than a smooth-surfaced conveyor.

FIG. **5** illustrates a materials conveyor for advantageously supplying raw materials to the concrete mixing plant. In this arrangement, floating platform **18** is shown floating on the surface of the pool, and there is located either laterally or upstream a beach **50** or bench on which a supply means, such as a hopper **51,** can be placed. A dog-leg conveyor **52,** mounted on pontoons **53,** is first rested on the dry river bed. As the pool rises, the pontoons variously rise with the surface of the pool, and the segments of the materials conveyor **52** convey materials one to the next, out to the floating platform. The floatable materials conveyor **52** thereby rises with the surface of the pool and with the concrete mixing plant. The segments may pivot relative to each other, and rise and fall relative to one another, so that a flexible delivery system is provided.

FIGS. **6–10** show additional features which can be utilized in building a dam by a process according to this invention.

It is implicit in FIGS. **1–5** that a pool would somehow be formed in the streambed upstream of the damsite and adjacent it, and the dam gradually built up from the bottom. Equally implicitly, one would expect to protect the concrete while still wet from the water of the stream. However, FIGS. **6** and **7** show the use of an upstream cofferdam **100,** an inlet pipe **101** which bypasses the cofferdam, and an inlet valve **102** which controls water flow through pipe **101.**

There is also shown a diversion tunnel **103,** and a valve **104** which controls the flow of water through the diversion tunnel. The diversion tunnel bypasses both the cofferdam and the damsite **13.**

A ditch **105** is dug between the cofferdam and the damsite, adjacent to the damsite, and the platform is placed in this ditch. Then water can be admitted to the ditch to float the platform, and the process of constructing the dam will be commenced. The stream will be diverted through the diversion tunnel whenever the stream level becomes too high relative to the cofferdam, or after the cofferdam is flooded out, then relative to the height of the dam itself.

Water is permitted to rise between the growing dam and the cofferdam as the dam rises, and finally, the cofferdam will be submerged and of no further use. The water is not permitted to rise to a level relative to the dam where its contact with the concrete will deleteriously affect the concrete. Accordingly, the top of the dam will ordinarily be above the water level, at such an elevation that the freshest concrete which restrains water will have been poured at least about 2 days earlier.

While the location of the platform in FIGS. **1–5** can closely be controlled by taking in and letting out the positioning lines as shown, there may be a tendency of the platform to tilt or to rock when the concrete conveyor means is extended or withdrawn, or moved from side to side, or when the load on the concrete conveyor means changes. Accordingly, FIGS. **8–10** show a pre-

ferred embodiment of the invention wherein the discharge point of the system is stabilized.

Stabilizing means for stabilizing the free end of the concrete conveyor means may take one or both of two convenient forms. The first form is that of a steady-rest for the free end of the concrete conveyor means, and the second form is restraints connected to the floating platform which prevent substantial angular motion of the floating platform, such as by tilting or pitching.

FIGS. **8, 9** and **11** show a stabilizing means of the steady-rest type. A steady-rest **110** has four flanged wheels **111, 112, 113** and **114** which ride in pairs on rails **115** and **116.** The rails may be laid upon the dam or otherwise supported at one or both of the faces of the dam by attachment to it, or by attachment to forms such as to upstream form **117.** Downstream form **118** is spaced downstream from form **117.** If desired, lateral forms (not shown) may be placed so as to interconnect forms **117** and **118,** thereby to provide regions to receive and confine the freshly-poured concrete in blocks. Alternatively, with this process it is possible to pour the concrete continuously from side to side of the dam, without the additional lateral forms.

The steady-rest includes a body **119** to which the wheels are journaled. The body includes a pair of side plates **120, 121,** and a freely-rotatable roller **122** between them. Floating platform **18,** with the same features as that shown in FIG. **1,** is placed adjacent to the upstream face of the dam. Concrete conveyor means **35** extends from the platform so that its free end **123** overhangs the top of the dam. The conveyor rests atop roller **122** and is laterally restrained by the side plates. The side plates are spaced far enough apart to permit substantial angular movement (in plan view) of the conveyor relative to the face of the dam and to the platform. The steadyrest can roll along the tracks so as to be underneath the conveyor at all times, regardless of the location of the platform along the dam face, and regardless of the angular relationship (in plan view) between the platform and the conveyor. Therefore, the position of the free end of the conveyor is stabilized, and it will not whip around in response to rolling or pitching of the floating platform.

FIGS. **8, 9** and **10** further illustrate another form of stabilizing means which may be used instead of, or in addition to, the steady-rest. Four stabilizing lines **130, 131, 132** and **133** are connected to the same points of attachment **134, 135, 136** and **137** as positioning lines **29, 30, 31** and **32.** However, instead of being connected to the floating platform near the deck, they are attached to a common point **138** at the free end of a mast **139** well above the deck, perhaps 30 to 50 feet above the waterline, while the positioning lines will be only about 3 to 5 feet above the waterline. Preferably, this mast is telescopic, and it is shown with sections **140, 141, 142** and **143** extended. They may be retracted to shorten the mast by hydraulic means or by other means not shown. Stabilizing lines **130–133** can also be taken in and let out, and, if desired, means (not shown) may be provided for doing this, just as in the case of the positioning lines. They may instead be let out or shortened by hand.

Point **138** is substantially spaced above the waterline **144** and, therefore, the stabilizing lines exert a substantial restraining torque which tends to keep the floating platform from pitching or rolling. The positioning lines prevent the floating platform from shifting laterally. Therefore, even without the steady-rest, the stabilizing lines will stabilize the free end of the conveyor. Used together, the two stabilizing means result in a remarkably stable system. The telescoping feature of the mast enables the floating platform to rise and lower relative to a point in space without readjusting the lengths of the four stabilizing lines. Adjustment of the height of the mast relative to the platform also can adjust the torque exerted by the restraining lines around a turning point located in the mast below point **138.**

The view in FIG. **9** is taken off the vertical to show the relationship between the positioning and the stabilizing lines.

While concrete itself cannot safely be run through chutes without segregation, the same objections do not arise with respect to the raw materials of which the concrete is made. The aggregate, as well as the cement, may be simply dropped down chutes to the supply means without special care. Furthermore, in the bottom of the canyon one is as close to the coolest part of the ecological system as possible, namely to the water of the river, and furthermore, is often within the shading walls of the canyon itself. Therefore, materials stored at this elevation, or even cooled by water readily pumped from the river, are optimally cooled. The result of this arrangement is that there is a marked reduction in requirements for refrigeration and cooling capacity in order to lower the initial temperature of the concrete.

This invention thereby provides a means for the safe and closely coupled mixing and placement of concrete on a dam. It completely eliminates the requirement for conventional cableways with all of their inconveniences and risks, and can provide a mixing plant only a few feet away from the actual placement site. The mixing plant can conveniently be moved back and forth laterally along the upstream face of the dam. The materials of construction can handily be supplied to the mixing plant and can be kept cool, both in storage and on their way to the mixing plant. The change in elevation of the concrete once mixed can be minimized, and in general, a new and more convenient means of placing concrete at the placement site on the dam is provided.

Also, with either or both of the stabilizing means shown, the location of the free end of the conveyor can closely be controlled, and even in rough weather constitutes no risk to the workmen.

This invention can also utilize any class of concrete mixer, continuous or batched, and is adaptable to any mixing or delivery system presently known. It has the advantages of inexpensiveness of construction, flexibility of use, and safety in operation. There is close control and convergence between the properties of the concrete at the mixing plant and at the placement site.

The process according to this invention also offers to the dam builder the election of shutting down production during dry years, without leaving unused the large capital assets ordinarily associated with large mixing plants and cableways. Obviously, a completed dam without water behind it has been built before it was needed, although such a result is an economic hazard that is necessarily assumed when dams are built by conventional means (unless the entire plant is to be left unused and in place). This invention permits the dam to be built as the water rises, and ties up no more than a

barge with its mixer and conveyors. Gross variations of water supply and release can be controlled by diversion tunnels in accordance with known practice.

It is also evident that the rate at which the dam can be built can be inexpensively multiplied by the expedient of adding additional platforms. The production rate in conventional practice is limited by the capacity of the cableways, which cannot inexpensively be increased or multiplied.

Further, the production rates and continuous operation which can be obtained with this system, together with the face that, because the concrete can be handled by concrete conveyor means, enables the concrete to be very dry—it need not pour out of a bucket or slide down a chute. When the concrete may be made so dry, the reaction in the concrete is primarily that of hydration, and this releases less heat than is given off in the setting of wetter concrete. Accordingly, it is not necessary to leave expansion joints to permit the hot concrete to expand, and from which it contracts on cooling. Such joints must later be filled with grout. The cooler concrete which can be used in this invention, both as a consequence of starting with colder materials and as a consequence of working with drier concrete, can be poured continuously, without grouted joints. This is a remarkable saving.

In this specification, the term "side to side" is sometimes used to describe the dimension between canyon walls—along the top of the dam.

Also, in this specification, the various lines are sometimes defined as being connected to the ground. By this is meant connection to the ground, although it may be through some other means, such as by connection to the dam (which is, of course, connected to the ground), or to buoys or the like, which are themselves anchored to the ground. These means are sometimes referred to as "stationary means."

This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

I claim:

1. A process for building a dam at a damsite across a stream of water comprising: forming a pool upstream of the damsite and adjacent thereto; placing water in the pool; floating a floating platform in said pool, said floating platform bearing a concrete mixing plant and a concrete conveyor means for the concrete mixed by the mixing plant; discharging concrete from said concrete conveyor means at a placement site on the damsite so as to build the dam and progressively increase its height, permitting the elevation of the surface of the pool to rise as the dam's height increases, but maintaining the said height so that the surface of the pool is lower than the top of the dam and placing the floating platform in the pool so that the top of the dam is within the reach of the concrete conveyor means, whereby the concrete is mixed at a location relatively close to the placement site, and moving the platform from side to side in the pool so as to keep to a minimum the distance by which the concrete must be transported relative to the face of the dam.

2. A process according to claim **1** in which the level of the pool is maintained so as to minimize the slope, if any, along which the concrete must be moved from the mixing plant to the placement site.

3. A process according to claim **1** in which the elevation of the mixing plant is varied relative to the surface of the pool to adjust the relative height of the mixing plant relative to the placement site independently of the elevation of the floating platform.

4. A process according to claim **1** in which a floatable materials conveyor is extended between the shoreline and the floating platform to supply materials to the concrete mixing plant, the elevation of floatable materials conveyor rising with the surface of the pool.

5. A process according to claim **1** in which the floating platform is positioned by taking in and letting out positioning lines affixed to the platform and to stationary means spaced from the floating platform.

6. A process according to claim **1** in which the floating platform is stabilized by stabilizing lines affixed to the platform above the waterline and to stationary means spaced from the floating platform.

7. A process according to claim **6** in which the floating platform is positioned by taking in and letting out positioning lines affixed to the platform and to stationary means spaced from the floating platform.

8. A method according to claim **1** in which a cofferdam is placed upstream from the damsite, the floating platform is placed between the cofferdam and the damsite, and water is admitted between the cofferdam and the damsite, whereby initially to form said pool and initially to float said floating platform.

9. In combination: a dam under construction; a pool contiguous to and upstream of the dam; a source of water for the pool whereby the elevation of the pool can rise by being trapped by the dam; a floating platform on the surface of said pool; a concrete mixing plant on said platform; concrete conveyor means carried by said floating platform for transporting the mixed concrete from the mixing plant to a placement site on the top of the dam, said concrete conveyor means having a free end disposed at the placement site to discharge concrete at the placement site; and positioning means connected to the floating platform and to stationary means spaced from the floating platform for locating the platform in the pool.

10. A combination according to claim **9** in which elevation adjustment means is provided for adjustably varying the elevation of the mixing plant relative to the surface of the pool independently of the elevation of the floating platform.

11. A combination according to claim **9** in which elevation adjustment means is provided for adjustably varying the elevation of the mixing plant relative to the surface of the pool comprising flotation means of adjustable buoyancy supporting the floating platform.

12. A combination according to claim **10** in which the elevation adjustment means comprises jack means disposed between the platform and the mixing plant.

13. A combination according to claim **9** in which a floatable materials conveyor is extended between the shoreline and the floating platform to supply materials to the concrete mixing plant, the elevation of the floatable materials conveyor rising with the surface of the pool.

14. A combination according to claim **9** in which the stabilizing means is provided to stabilize the said free end of the concrete conveyor means.

15. A combination according to claim **14** in which said stabilizing means comprises a steady-rest which is supported by the dam and which is movable from side

to side along the dam and upon which the conveyor rests.

16. A combination according to claim **15** in which a rail is laid atop the dam, and in which the steady-rest includes a wheel which rolls along the rail.

17. A combination according to claim **14** in which said stabilizing means comprises a plurality of stabilizing lines attached to the floating platform at a substantial elevation above its waterline, and to stationary means at points spaced substantially away from the floating platform in plan view, whereby to exert a restraining torque to resist pitching and rolling of the floating platform.

18. A combination according to claim **17** in which a mast extends vertically from the floating platform, the restraining lines being connected to the mast.

19. A combination according to claim **18** in which the mast is telescopically extensible and retractible.

20. A combination according to claim **9** in which the positioning means comprises lines attached to the floating platform and to stationary means spaced from the floating platform, which lines can be taken in or let out to move the platform.

21. A combination according to claim **14** in which the positioning means comprises lines attached to the floating platform and to stationary means spaced from the floating platform, which lines can be taken in or let out to move the platform.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,845,631 Dated November 5, 1974

Inventor(s) GEORGE L. MALAN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Drawings "Sheet 1 of 2" should read --Sheet 1 of 3--

"Sheet 2 of 2" should read --Sheet 2 of 3--

Sheet 3 of 3 should be added

Col. 7, line 12 "face" should read --fact--

Signed and sealed this 18th day of February 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334