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PN-AAD-313

CSD/3305

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December 27, 1972

Mr. A. Dale Swisher, P.E.
Environmental Health
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Washington, D.C. 20523

Dear Mr. Swisher:

Sixth Quarterly Progress Report on
Phase III "Field Research and
Testing of a Water Hand Pump for
Use in Developing Countries"
AID/csd-3305
October 1 through December 31, 1972

Major effort expended this past quarter was directed toward the establishment of the United Nations Children's Fund (UNICEF) program in which the AID pump will be used. As reported last quarter, over 140,000 pumps will be made and placed in the field. In addition to this work, the experience gained in Khon Kaen, Thailand, has resulted in concepts for improving the Deep Well Pump design. It is expected that pumps incorporating the improvements will be set up in the laboratory during the coming quarter.

The UNICEF Program

Perhaps the most dramatic decision made to date on the UNICEF pump program is the adaptation of the AID pump design to the Bangladesh society instead of the Maya No. 6 pump* used for many years in this area and other countries of the East. This decision is based on the more sturdy construction of the AID design, increased bearing area, and improved cup life. Versatility of

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* See Battelle Final Report to AID dated September 29, 1967, for description of Maya Pump.

the design to accommodate deep well type pumping as well as shallow well type pumping was also a factor as the water table is changing to the point where more and more deep well type pumps will be required.

In view of the local market and available skills and facilities for manufacturing, some design changes appear quite appropriate.

(1) The body and cylinder shell will be cast in one piece. The cylinder portion will be lined with a section of thin wall Polyvinyl Chloride (PVC) pipe when used for shallow well pumping.

(2) The body and cylinder combination will be bolted to the base which will house the poppet check valve when the cylinder is in the pump body. The base is of such configuration that it can be used with 1-1/4-inch, 1-1/2-inch drop pipe, and 4 inch casing.

(3) Five-eights-inch diameter pins (minimum) will be used at all pivots with at least 0.937-inch^2 bearing area. The pins will be restricted from rotating with respect to the moving part.

Figure 1 is an artist's sketch of the external appearance of the shallow well pump.

One departure from the norm that is expected to prove successful is the use of PVC pipe for drop pipe and well casing. Although this is not a part of pump design, if successful, ground water to the consumer will be less expensive as well as more reliable.

Field Test Reporting

Currently work conducted in Nigeria will be reported to Battelle through Erik Fraser, Water Systems Engineer, CARE, and Mr. Romeo Barberopoulos, President, Nigerian Foundries. Mr. Robert Berg, Chief of Office of Capital Development and Finance, USAID Mission to Nigeria will monitor the program and can serve as monitor of the activities in that area.

Khun Sa-ard, Chief Water Resources Division, Office of Field Operations, USOM, Thailand, will report to Battelle and Washington on activities in Khon Kaen and Bangkok, Thailand.

Mr. Richard Phillips, Water Engineer, UNICEF, Dacca, and Mr. Poul Larsen, Coordinator Emergency Operations, UNICEF, New York, will furnish whatever data is desired concerning the program in Bangladesh.

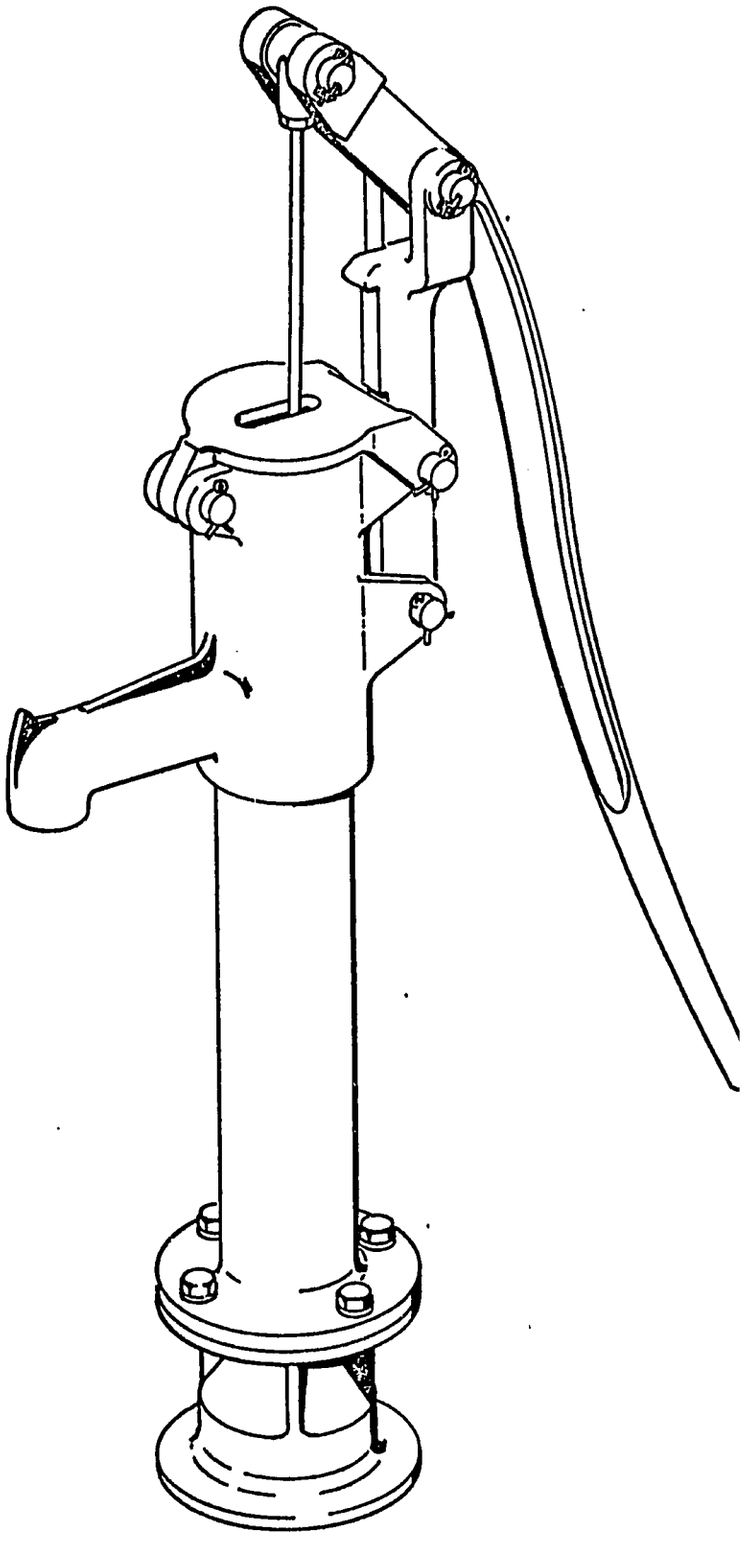

FIGURE 1. SKETCH OF AID SHALLOW WELL PUMP MODIFIED FOR BANGLADESH

Modified Deep Well Pump Concept

During the last visit to Thailand, October 18-19, it became quite apparent that two modifications to the design need to be made. First, field testing indicates the need for larger bearing surfaces and nonrotating pivot pins at the rotating joints. The larger bearing area decreases the "wear" forces and should provide longer life. This is being done in the pump for Bangladesh by increasing the pin diameter to 5/8 inch and bearing length to 1-1/2 inches. Restricting the rotation of the pins will restrict the wear to the longer bearing sections in the fulcrum, handle, and rod end where less wear will occur. This will be done on the pump for Bangladesh by cast groves in the appropriate parts to hold the pivot pin cotter keys in a fixed position.

Second, the field tests show that the bending forces on the guide rod are considerably more than originally anticipated and that either a larger guide rod is required or some other way in which bending could be eliminated. Mr. Fittro from the Public Works Department in Laos related to us similar problems with their Dempster pumps but, perhaps more important, the high rate of wear of the bushings in contact with the guide rod. It was therefore decided that the guide rod should be exchanged for a better system which should accommodate the side loading and provide longer life bearings. Figure 2 shows the AID pump design (modified for Bangladesh) with a new type pump cap. This design does not require a guide rod and the two well supported sliding blocks (or rollers) should be more adequate for the side loading and provide more bearing surface than the previous design. When tightly fitted to the pump body, as required for use as a force pump, the new pump cap should provide a longer life to the pump rod bushing.

Future Work

During the next quarter patterns of the newly designed cap will be made and laboratory tests will be conducted as to the effectiveness of the change. It is anticipated that this work will be done in conjunction with additional work for UNICEF. The final evaluation is in the field and we anticipate sending patterns and perhaps a completed cap to Thailand and Nigeria if operation at Battelle is satisfactory.

If the new improved design for deep well pumps is successful then our Patent Department will be advised for further action.

If you have any questions concerning this report, please call us.

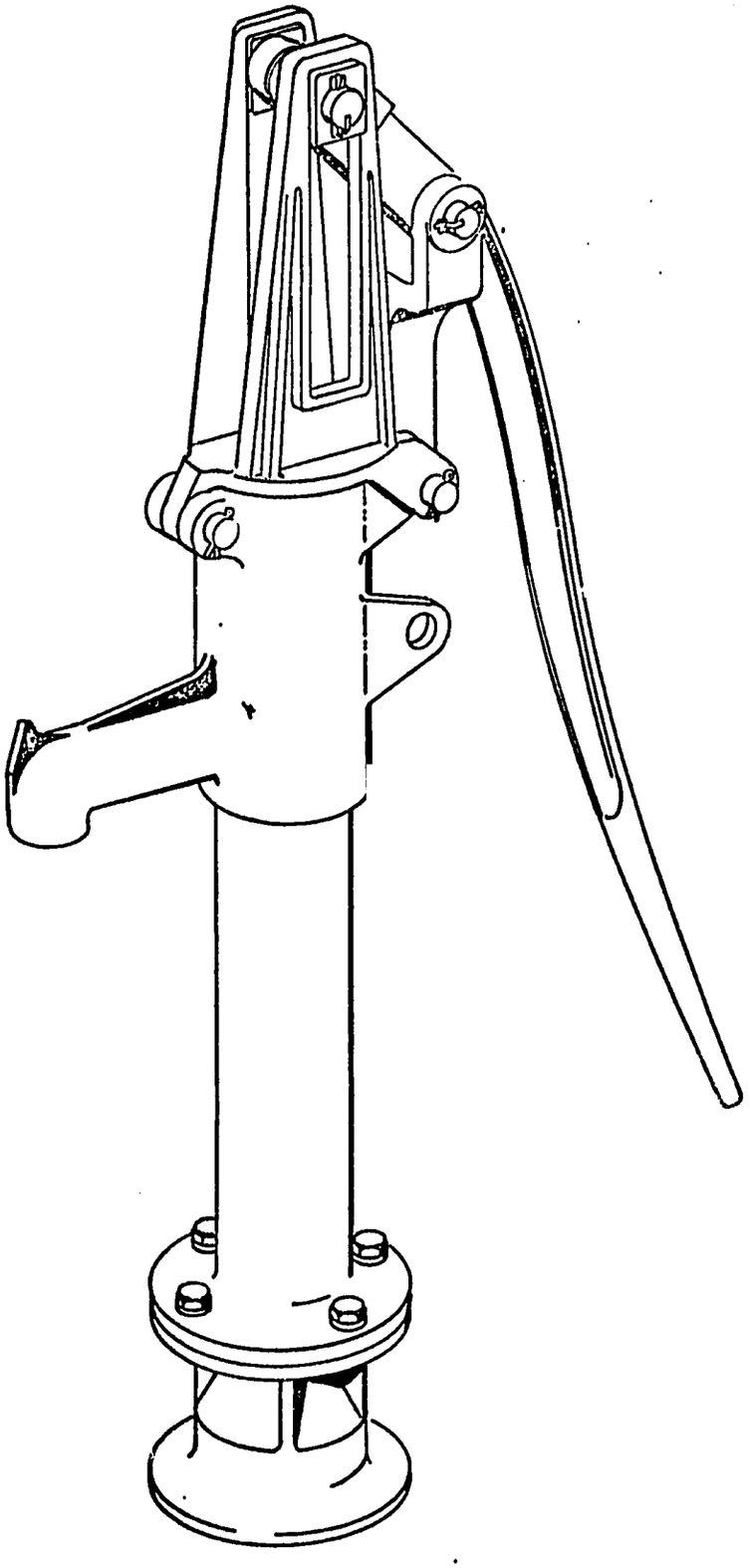

FIGURE 2. SKETCH OF AID DEEP WELL PUMP MODIFIED FOR BANGLADESH WITH REVISED PUMP CAP

Sincerely,

Robert D. Fannon Jr.

Robert D. Fannon, Jr.
Research Engineer

D. W. Frink

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Chief
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RDF/DWF:kch

Enc. (25)

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