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A BOTTOM SAMPLER FOR HARD BOTTOM

BY

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Introduction.

As early as 1896 the Director of the Danish Biological Station, Dr. C. G. Joh. Petersen, constructed an apparatus for quantitative determination of the fish food of the sea bottom. Later on he improved his instruments for that purpose and undertook systematical investigations over large areas of the Danish waters[1]. His results proved to be of such importance that similar investigations with the »Petersen grab« were carried out in many different countries. The grab has proved a very good and handy instrument, especially on soft bottom as met with in most places, but Dr. Petersen himself has pointed out that, in some places, the sea bottom is too hard for the instrument. Others have had the same feeling and thus the idea occurred to me of constructing a new apparatus which might be used as a supplement to the grab on such hard sandy bottom where the grab takes so little of the bottom material that it may be doubted whether or not the results are representative. I consulted Dr. A. C. Johansen on the matter, and he strongly advised me to try to construct such an apparatus, and was kind enough to have it tried for me.

Description of the Bottom Sampler.

The apparatus consists of an iron cylinder *AA* (Fig. 1), 30 cm. high and about 36 cm. in diameter, giving a crosssection area of 0.1 square meter. The cylinder is open below and the top of it closed by an iron cover with the chamber *B* on which a waterpump is fixed. This pump can be operated by turning the drum *C*. When this is done, water is pumped out of the cylinder, and if the latter stands on the sea bottom, the surplus of pressure thus acting downwards on the lid of the cylinder forces this into the sea bottom. On the drum *C* is wound a steel wire, 5 or 6 mm in diameter and about 100 meter in length, and when this wire is hove in by the steam winch on the ship, the drum is rotated and thus pumps. When all the wire has been reeled off the drum, the cylinder has sunk completely into the sea bottom and the end of the wire then acts on the lever at *D*, the wire being free of the drum. The lever is bowshaped with one branch fastened to the apparatus with a bolt on which it can turn at *E*, the other to the opposite part of the cylinder.

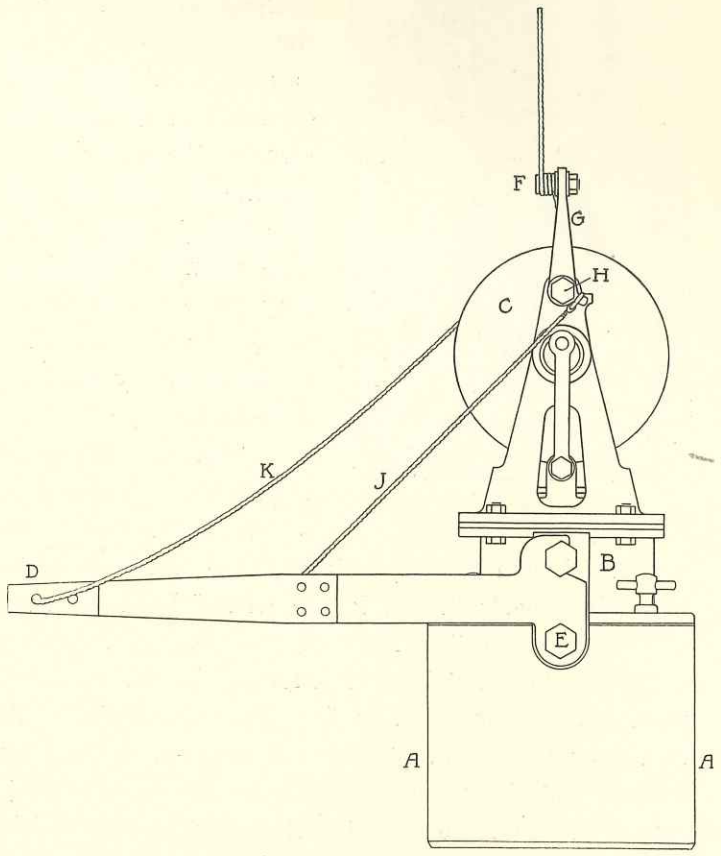

Fig. 1.

[1] Beretning til Landbrugsministeriet fra den Danske Biologiske Station XX, 1911, ved C. G. Joh. Petersen, København 1911.

When the point *D* is pulled upward by the continued heaving in of the wire, the cylinder is broken up from the sea bottom and the apparatus falls into a horizontal position. As soon as the apparatus begins to rise from the sea bottom it turns in the bowshaped lever, and when it is quite free of the bottom, it hangs with the drum downwards and the open end of the cylinder upwards, so that the bottom material contained in the cylinder cannot fall out when the apparatus is heaved in. In fact, the instrument has been quite full at the trials, bringing on board 30 liters of the sea bottom.

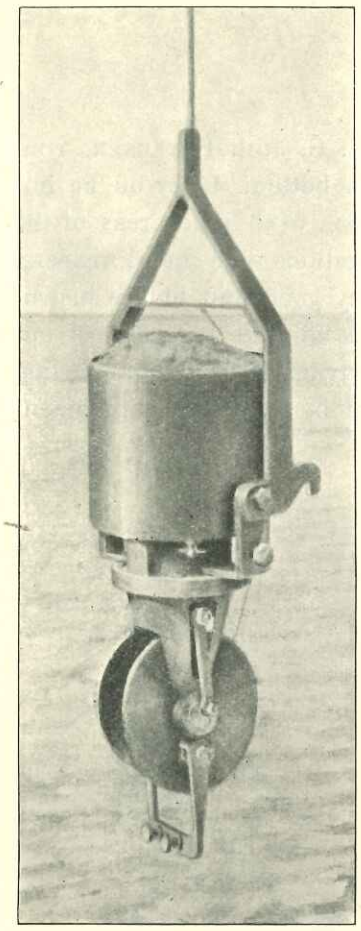

Fig. 2.

When the bottom material has been cleaned off the cylinder, the apparatus should be made ready for taking the next sample. The wire is wound on to the drum by means of a small handle which can be attached to the axis of the drum. When the drum is full, the wire is laid over the two bollards *F* in three or four turns, so that the whole apparatus can hang in the wire when this is tightened by rotating the steamwinch a little. The bollards *F* are fastened to an arcformed piece of metal *G* which can turn on a bolt *H* and on another one on the opposite side ot the apparatus. The lever *D* is then brought to a horizontal position and held there by means of a small piece of wire *J* whose upper end carries a ring or eye which is clasped on a hook on the arch *G*. The apparatus is now swung out over the rail and lowered to the sea bottom. As soon as it arrives there the wire is slackened, the end of the heavy lever *D* falls down on to the bottom, and in doing so it turns the arch *G* so that the bollards *F* point upwards. The turns of the wire spring free of the bollards and the steam winch is operated continually until the apparatus appears above the surface of the water (Fig. 2). The first part of the heaving causes the cylinder to work into the bottom as explained, the last part makes it rise to the ship. In order that the wire may come free of the drum and act on the lever, the wire is passed through an eye or a ring in the short piece of wire *K*, and the end of the long wire is thickened by means of a piece of metal or the like which cannot pass through the eye in the short wire *K*.

Since the drawings were made the device with the arch *G* and bollards *F* have been replaced by another one. The wire *J* is hooked into the edge of the drum, and is thus preventing this to rotate when the apparatus is lowered. When the apparatus reaches the bottom, the weight of the lever *D* rotates the drum a little and thus disconnects the hook and wire *J* from the edge of the drum.

In order that material from the sea bottom may not pass through the pump when it is operated, a fine meshed metal net is inserted in the upper part of the cylinder, and strengthened with a metal plate with small holes. In fact, the light detritus lying on the sea bottom was hardly disturbed when the samples were taken. If it should happen, as it generally does, that the cylinder is completely filled with bottom material before all the wire has been wound off the drum, the further rotating of this becomes a very hard task. To obviate this inconvenience it is intended to put a safety valve at the chamber *B*. If this valve opens at a pressure difference of 2 atmospheres an upper limit has been put to the force with which the cylinder is pressed down into the bottom, but this limit is still as high as 2000 kilogrammes which will probably be sufficient in most cases. If not, the safety valve may be tightened.

As the capsizing of the instrument has proved to be a good principle, a new bottom-sampler for soft bottom is now under construction. This sampler is not provided with the pumping gear and should thus be as handy as the grabs. It is intended to provide this instrument with a rubber cover to protect the content from washing out during hauling up.

750. 23/III 1927.

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