

[72] Inventor **Saburo Okabe**
Tokyo, Japan
[21] Appl. No. **756,032**
[22] Filed **Aug. 28, 1968**
[45] Patented **Mar. 30, 1971**
[73] Assignee **Toa Kowan Kogyo Kabushiki Kaisha,**
Chiyoda-ku
Tokyo, Japan

[56]

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Primary Examiner—Ernest R. Purser
Attorney—Steinberg and Blake

[54] **PROCESS FOR EXCAVATION OF HARD UNDERWATER BEDS**
2 Claims, 4 Drawing Figs.

[52] U.S. Cl. **299/17,**
37/195, 175/67

[51] Int. Cl. **E21c 45/00**

[50] Field of Search 299/16, 17,
81; 175/67, 68, 422, 14; 37/62, 63, 195

ABSTRACT: A process for excavating hard underwater beds characterized in that compressed air is ejected around jets of high pressure water so as to blow off existing water from the peripheries of said water jets thereby to enhance the excavating efficiency of said hydraulical jets.

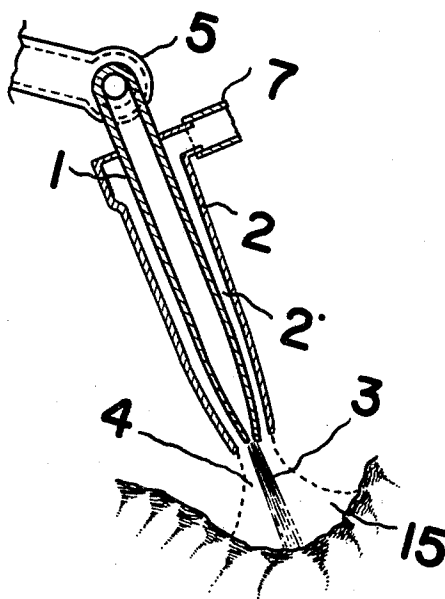


FIG. 1.

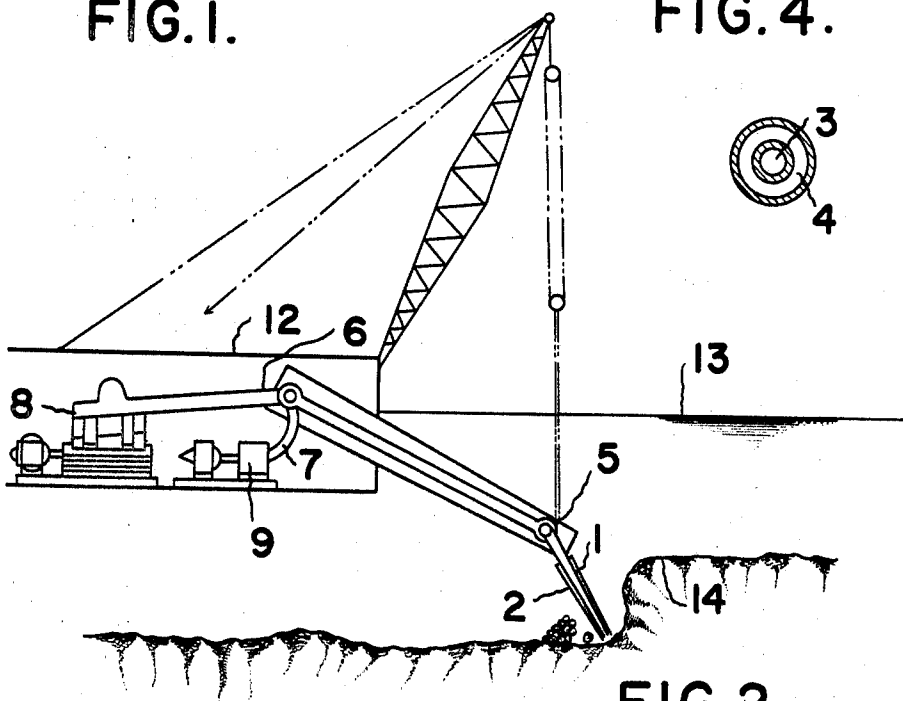


FIG. 4.

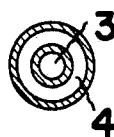


FIG. 2.

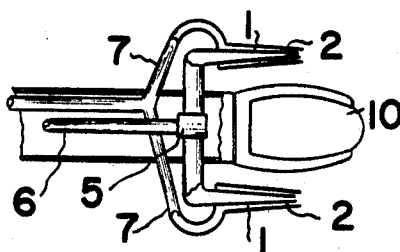
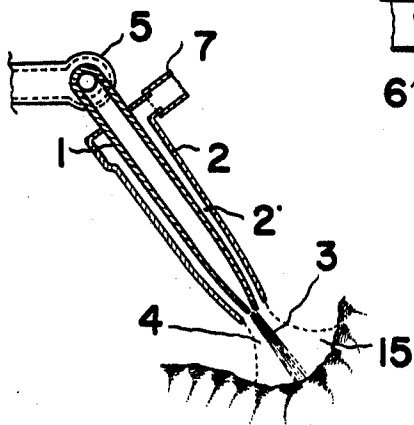


FIG. 3.



INVENTOR

SABURO OKABE

By: *Steinberg & Blake*
attys

PROCESS FOR EXCAVATION OF HARD UNDERWATER BEDS

This invention relates to a process for excavating hard underwater beds. The principal object of the invention is to achieve excavation of hard underwater beds with extreme ease and in positive way.

In the accompanying drawing showing an embodiment of the present invention:

FIG. 1 is a diagrammatic view of an excavator for digging a hard underwater layer, as installed on and supported by a dredge;

FIG. 2 is a top plan view of the excavator, partly broken away;

FIG. 3 is a partly enlarged sectional view of the front end structure of the excavator; and

FIG. 4 is a transverse section schematically illustrating the flow.

The present invention is directed to excavation of underwater rocky beds by taking the advantage of powerful jets of water. Since water jets are generally weakened in water, the present process utilizes compressed air to blow off the existing water from around the passages of the water jets in order to permit the water jets to work as effectively as in air.

The present invention will be more fully described hereunder in conjunction with the embodiment shown in the accompanying drawing. Referring now to FIG. 3, a penstock nozzle 1 is tapered at the front end to sharply increase the flow velocity in order thereby to crush and dig a rock bed by each powerful jet 3 of water.

A compressed air pipe 2 supplies a jet of compressed air 4 around the jet 3 (FIG. 4) to blow off water from the space 15 (FIG. 3) around the jet 3. While the air pressure is higher than the natural water pressure exerted against the bottom, the jet 3 of water in air is confronted by less resistance than that which is met as it is directly jetted out into water. Thus, each jet 3 of water can attack the rock bed through the airy passage, effectively and with a high efficiency.

Jetting water from a high pressure pump 8 passes through a penstock 6 and is divided into two streams by a swivel joint at the front end 5 of duct 6, and then each branched jet is ejected through each penstock nozzle 1. The ejecting directions can be freely changed at the front end 5 under control from the control room of the dredge.

Compressed air from a compressor 9 passes through a hose which is branched near the front end and communicated respectively to the roots of left and right water ejecting pipes so that the jets of air can provide air screens to both of the water jets.

In the drawing, numeral 10 indicates a cutter of suction dredge or barge 12. Water level is designated at 13 and a bottom is designated at 14.

In the embodiment shown, the front end of penstock 6 is branched sidewise at the free end 5 to form two tapered nozzles 1, in such manner that each of the nozzles is surrounded by the front end portion of a compressed air pipe 2 with a suitable gap 2' provided therebetween.

With such arrangement, the process according to the present invention can be practiced with utmost ease and the intended purpose can be realized with perfection.

I claim:

1. A process for excavating hard underwater beds characterized in that compressed air is ejected within a body of water around jets of high pressure water so as to blow water from and form a tubular air space around the water jets thereby to enhance the excavating efficiency of the water jets.

2. A process for excavating hard underwater beds according to claim 1 characterized in that the front end of a penstock is branched sidewise and forms tapered nozzles, each nozzle being surrounded by a tapered front end of compressed air pipe with a suitable gap provided therebetween, and high pressure water is jetted out of said nozzles of penstock while compressed air is jetted out of the tapered ends of branched compressed air pipes through said gap into the spaces around said jets of high pressure water.

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