April 19, 1932. A. G. ROTINOFF 1,854,383

MEANS FOR DREDGING, EXCAVATING, AND CONVEYING MATERIALS

Original Filed Dec. 13, 1928

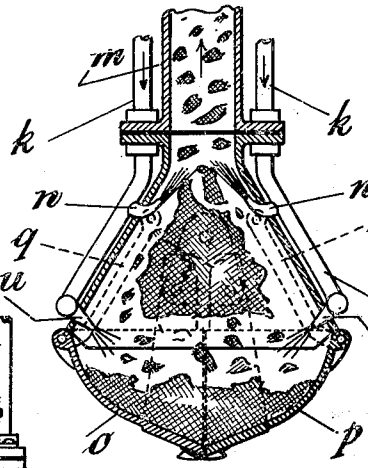



Fig.1.

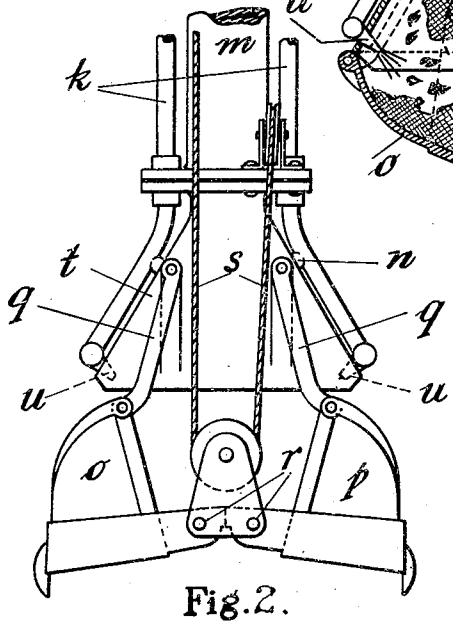



Fig.2.

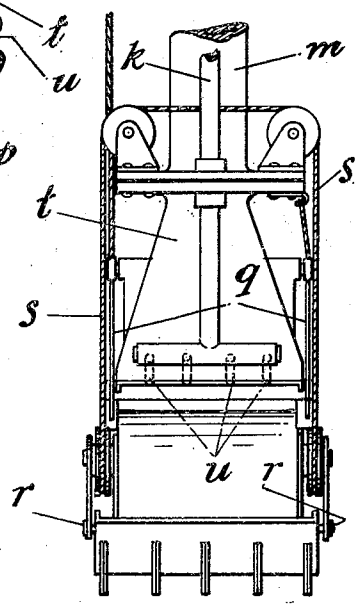



Fig.3.

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# UNITED STATES PATENT OFFICE

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## MEANS FOR DREDGING, EXCAVATING, AND CONVEYING MATERIALS

Original application filed December 13, 1928, Serial No. 325,810, and in Great Britain December 30, 1927. Divided and this application filed December 4, 1929. Serial No. 411,616.

This invention has for its object to provide an improved method of and means for dredging, excavating and conveying materials.

In general, in accordance with the present invention, the material to be dredged, excavated and conveyed is broken up or disintegrated and lifted or conveyed by powerful air jets which are directed into the material after it has been detached from the body or mass of earth. The method is simple, quick and efficient and can be utilized for many services as hereinafter more fully indicated.

My present invention further comprises a chamber at the bottom of a discharge pipe, means delivering compressed air into such chamber to force any material therein up such discharge pipe, and means for forcing material into such chamber to be acted upon by the compressed air and for closing the chamber during the action of such air.

My invention further comprises a mechanical grab or bucket constituting the chamber into which the material is forced and from which it is discharged along a pipe connected to the grab, by compressed air which issues into the earth or soil enclosed within the grab.

If desired, the compressed air may be passed into the soil intermittently, as, for example, by the periodic release of a large volume of high pressure air, so as to produce a series of explosions within the chamber which increases the effectiveness of the distintegration and discharge and allows of economy in air consumption.

My invention may be applied to a dredger discharging into a hopper barge or to a self-propelling hopper vessel. The application of my invention is simple and does not involve the use of heavy or complicated and expensive machinery. The jetting chambers may be disposed at one or both sides or at the stem of the dredging vessel. They may be pivotally supported from above to give them freedom to adjust themselves to the contour of the surface on which they act. The chambers may be pulled or pushed along in order to force them into the material to be excavated and so produce trenches. All materials with the exception of rock can be dealt with and excavation at any desired depth may be undertaken. The improved method on account of its simplicity can be applied in many cases where bucket ladder or suction dredges cannot be used. The improved apparatus can be brought close to jetties, quay walls and banks, either from land or from vessels.

My improvement can also be applied for unloading from barges or vessels any excavated material which can be blown and conveyed for discharge to a considerable distance.

It can also be applied for boring of wells and digging of trenches and formation of embankments and reclamation work.

Referring to the accompanying explanatory drawings:

Figures 1, 2 and 3 illustrate my improved dredging, excavating and conveying means, Figure 1 being a sectional side elevation with the grab or bucket closed, Figure 2 a side elevation with the grab or bucket open, and Figure 3 an end elevation of the parts as shown in Figure 2.

The same reference letters in the different views indicate the same parts.

In the arrangement shown in Figures 1, 2 and 3, a mechanical grab or bucket is transformed into a semi-pneumatic one. It is employed to detach and enclose a mass of earth or soil so that it can then be subjected to the disintegrating and discharging action of compressed air supplied to the interior of the grab and directed into the earth or soil therein. The operations of such grab are only limited to biting the soil and to short uplifts. The conveying and discharging is done by pneumatic means. The grab comprises two pivoted jaws $o$, $p$ carried by links $q$ and pivoted about rising and falling pivots $r$ operated by rope gearing $s$ in a known manner. The head $t$ of the grab is of closed tapered construction terminating in the discharge pipe $m$. Compressed air is supplied by pipes $k$ to nozzles $u$ disposed at the base of the fixed head $t$ of the grab. When the jaws $o$, $p$ have been raised by the rope gearing $s$ so as to close upon the fixed head $t$, a closed chamber is produced into which the com-

pressed air is admitted so that it expands actually within the earth or soil in the chamber, breaks it up and discharges it up the pipe *m*. Booster nozzles *n* in the upper part of the fixed head assist in the expulsion of the earth or soil up the pipe *m*.

The discharge pipe *m* is of restricted cross section to prevent too large a pressure drop of the compressed air so that an effective conveying and discharge of the excavated material is ensured.

With the arrangement illustrated, the compressed air is prevented from bursting from the chamber into which the material to be excavated is forced even though such material be soft, for the chamber is mechanically closed during the air expulsion operation. There is therefore no waste of air and all its energy is concentrated upon the discharge pipe.

The types of mechanism or apparatus shown may be arranged at the stem of a steamer or may be at the stern or sides thereof, for dredging purposes, but they may be used wherever excavation work is to be carried out. The compressed air jets may be assisted by water jets, if desired.

What I claim is:

1. Means for dredging, excavating and conveying comprising jaws constituting a grapple bucket with a fixed closed upper part with a discharge pipe secured thereto, the said jaws biting off the earth or soil and then closing against the upper part, and air nozzles disposed in the latter to lift to blow out the material contained in the grab.

2. Means for dredging, excavating and conveying as claimed in claim 1, in which booster air jets are provided to assist in the expulsion of the earth or soil up the discharge pipe.

3. Means for dredging, excavating and conveying as claimed in claim 1, in which the upper part of the grab is of tapered form terminating in the discharge pipe with compressed air discharge nozzles disposed at the base of said upper part.

In testimony whereof I have signed my name to this specification.

ALEXANDER GEORGE ROTINOFF.