A PORTABLE, HAND OPERATED DEVICE FOR DRILLING IN SOIL AND SALT MARSH DEPOSITS

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INTRODUCTION

In working on the history of salt marshes it is often necessary to have a capability to obtain subsurface material. There are many systems available for obtaining these samples however, most of these devices are expensive, difficult to operate, and excessively heavy. Some small-diameter coring devices are simple enough to operate, however, they obtain only a small sample which has limited uses. The device that will be described here is a post-hole auger driller. This device has been used by others (Mudie 1975, Scott 1976) but only to depths of 4 m. Here a method will be described by which depths as great as 18 m can be reached using the auger. The auger has the advantages of being inexpensive to purchase, lightweight for easy transport, easy to operate for two people, and able to obtain a fairly large sample.

DESCRIPTION AND COST

The auger (Scott 1976, Fig. 4) can be obtained commercially. Since the hole produced is uncased, a small diameter auger is most suitable so that the hole will have more internal strength. The remainder of the equipment (Figs. 1, 2) can also be obtained commercially. The one-metre, galvanized, 2.5-cm pipes are extentions to enable the basic auger to drill deeper. Also seen are pipe wrenches, a wire puller, a pipe clamp, and two backpacks for transport. The equipment needed to drill shallow holes (3 to 4 m) can be purchased for approximately $40 (auger: $20; pipes: $5 apiece; pipe wrences: $11). For deeper penetrations more extentions, a pipe clamp ($15), a wire puller ($30), and backpacks ($4.50 each) are needed. Even with these added expenses the whole system can be obtained for less than $150. It should also be noted here that these prices are based on what was obtained in Halifax and prices will vary in different areas. The entire unit weighs less than 100 pounds and can easily be carried by two people.

METHOD EMPLOYED

For shallow depths (down to 6 m) the method is extremely simple. As the auger digs, pipe extentions are added as needed. Care must be exercised to keep the hole vertical. Also, a mark should be placed somewhere on the uppermost extention (in this case a hose clamp) from which the distince to the bottom of the auger is known. Samples can be taken at any desired depth. To obtain a sample the entire apparatus must be removed from the hole and a sample removed from the shovel. For most accurate sampling, the sample should be removed from the lowermost, inside portion of the shovel. Drill holes up to 6 m in depth can be drilled by two people at a rate of two or three a day depending on how many samples are collected, and the types of sediment encountered.

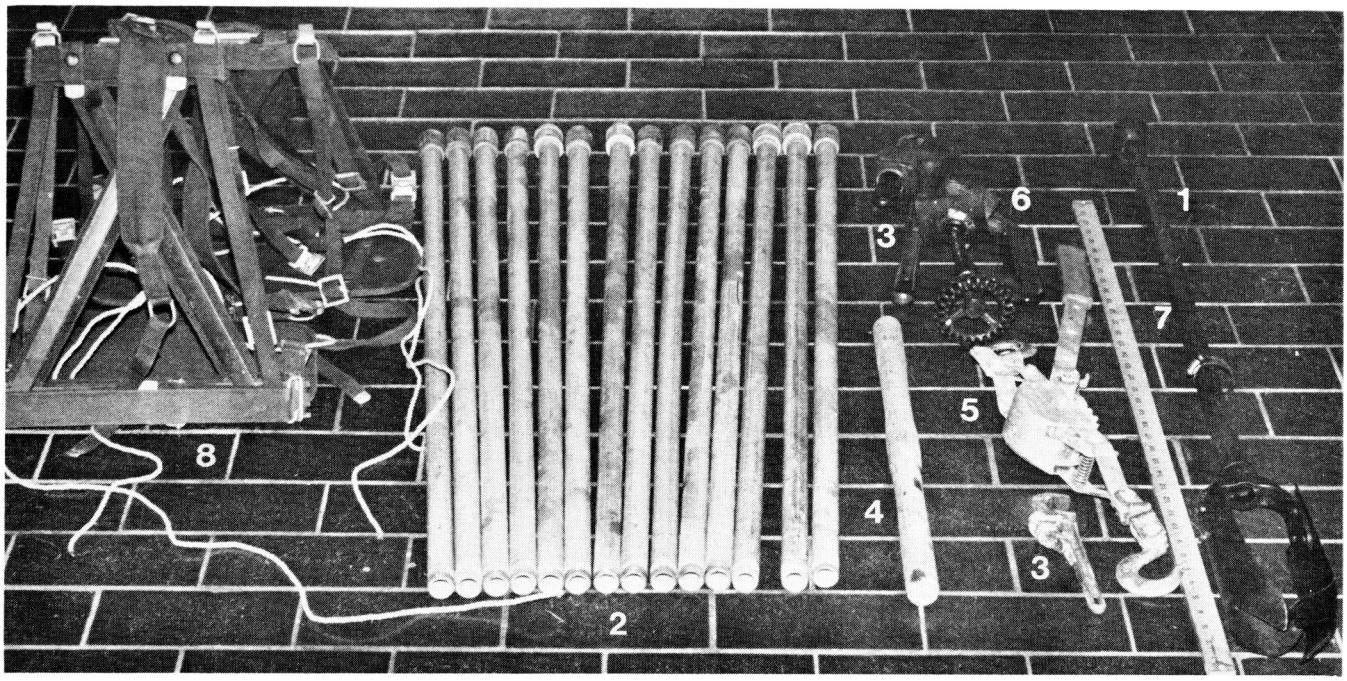

Fig. 1. Diagram showing the (1) auger drill, (2) pipe extensions, (3) pipe wrenches, (4) drill handle, (5) wire puller, (6) pipe clamp, (7) meter stick, (8) backpacks.

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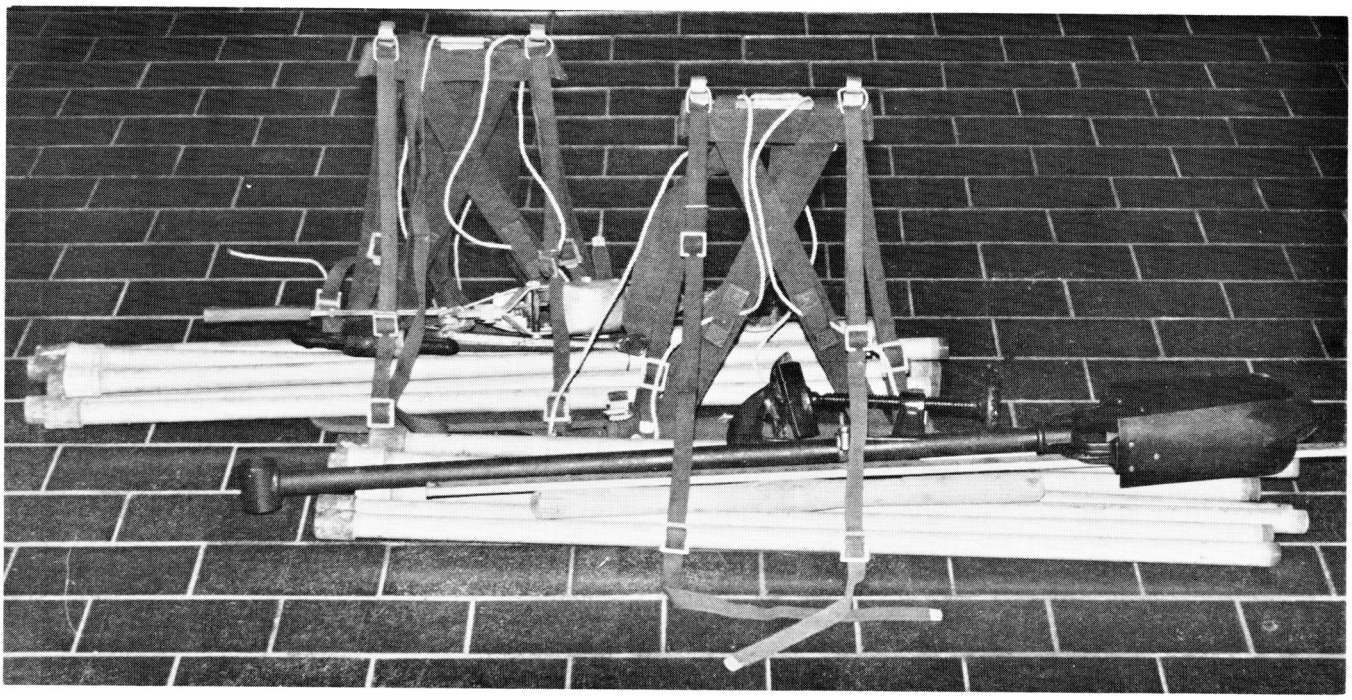

Fig. 2. Diagram of the equipment packed for transport. Each pack weighs under 50 lbs.

For drill holes deeper than 6 m the method becomes more complex, but is still manageable for two experienced people with some extra equipment. Down to depths of 6 m the apparatus can be used without disassembling the extentions. However, after 6 m the extentions become too flexible and very heavy to handle all at once. Also the auger has a tendency to get stuck in the hole more often, especially if the sediment is plastic and sticky. To free the auger from the hole a wire puller was used. The wire puller was attached with one hook to the top of 2 m of pipe sitting on a wooden platform with the other hook diagonally around the pipe just below a connector. To remove the apparatus from the whole in pieces, a pipe clamp has to be employed to hold the lower 6 m from falling back into the hole while the excess pipes are removed using the pipe wrenches. Using this method the authors were able to drill to a depth of 11.55 m in approximately 10 hours of working time.

DISCUSSION

This method has some obvious limitations. The sediment being drilled through cannot contain much sand or gravel without casing the hole to prevent cave-ins. Casing adds much additional weight and costs. The device must be brought to the surface at least every 25 cm of penetration to empty the shovel which is only 25 cm long. This problem could possibly be lessened if the shovel was modified to a length of 50 cm, so that the shovel could remain in the ground twice as long. Finally, the time required to drill a certain distance increases more or less exponentially with depth, especially after 6 m. The authors believe that the maximum practical depth to which this device could function is 18 m (three pieces 6 m long); after this the time required would become prohibitive.

Even with the limitations mentioned above this is one of the most productive subsurface sampling devices known. A bailer-corer used by Scott *et al* (1976) in similar types of sediment required a large tripod with a winch, running water, many metres of metal casing, and at least three people to operate it. This kind of system is too heavy to operate on spongy marsh sediments whereas the auger can operate almost anywhere that it can be carried because of its light weight.

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