3 Sheets—Sheet 1.

J. B. EADS.

Dredging-Machine.

No. 208,894. Patented Oct. 15, 1878.

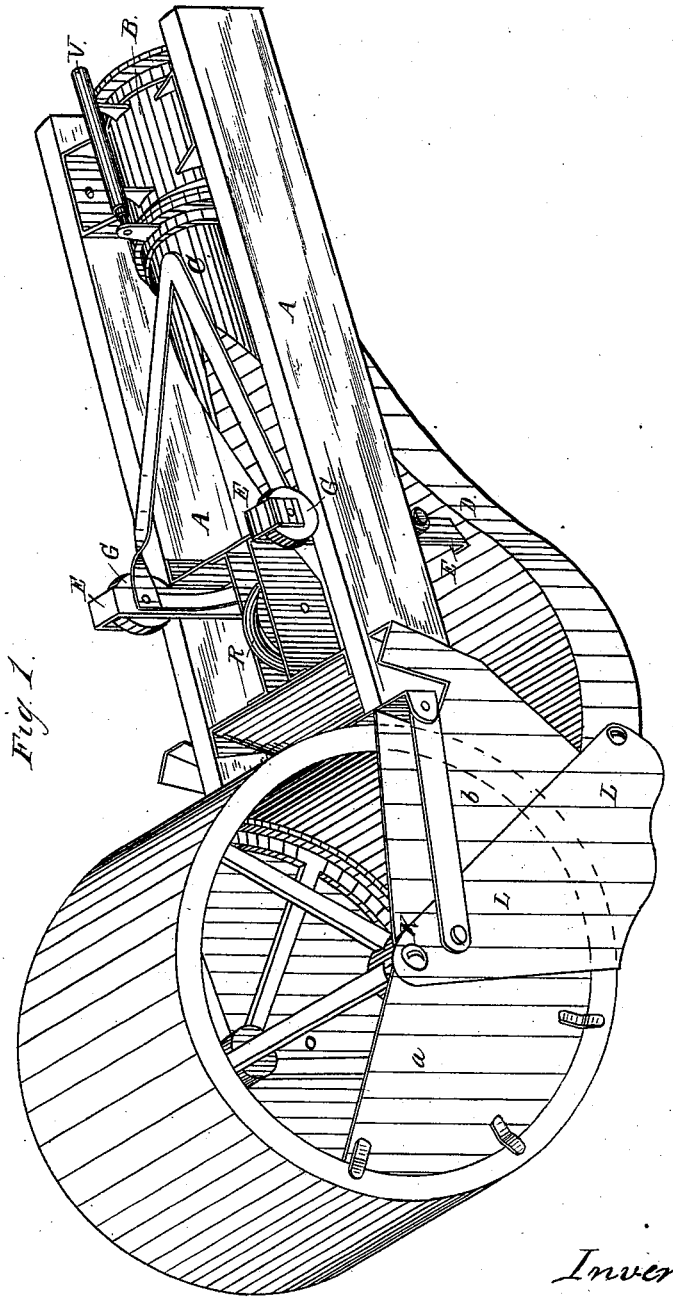

Fig. 1.

Attest.
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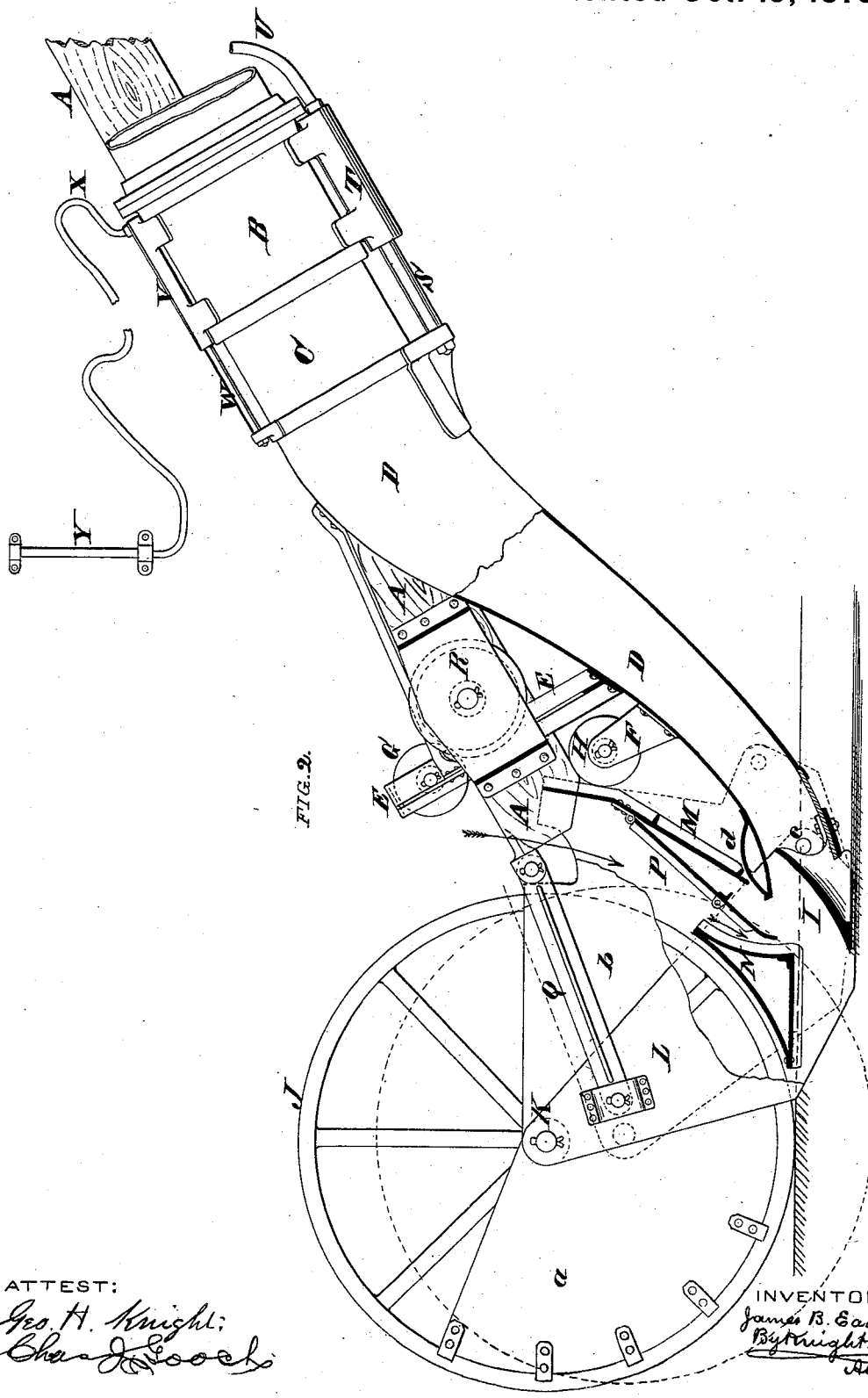

FIG. 2.

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FIG. 3.

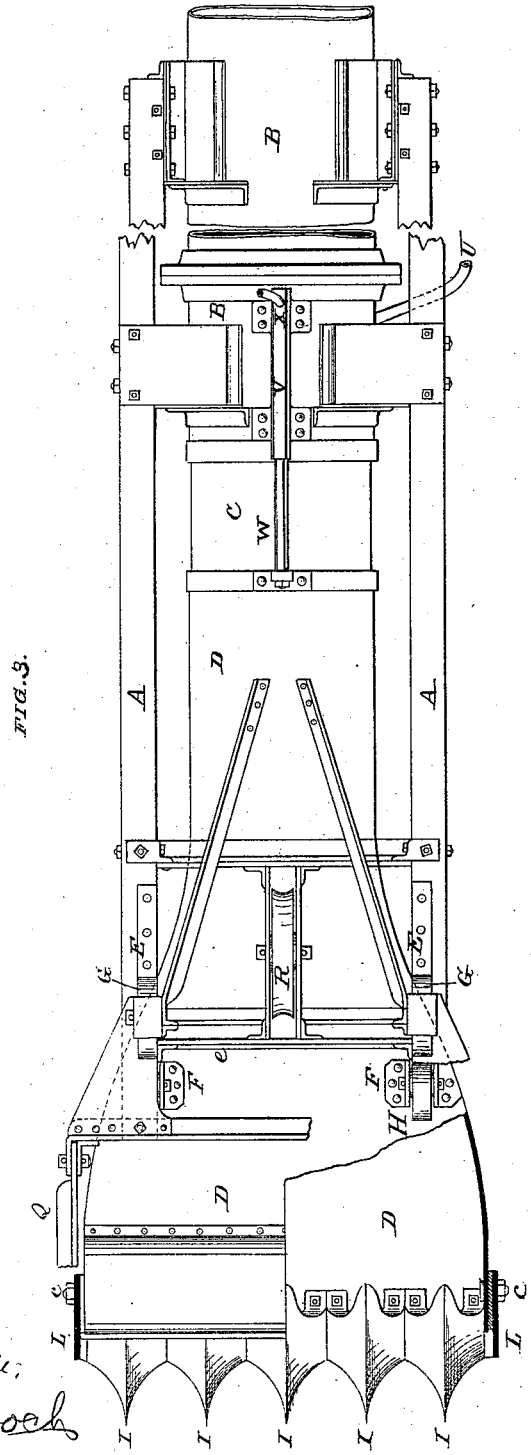
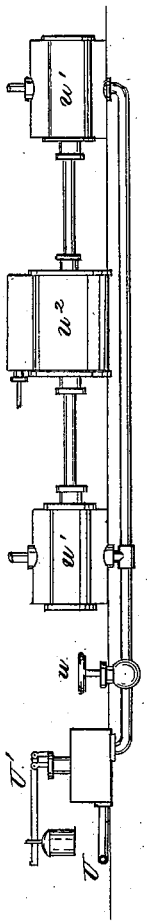


FIG. 4.



ATTEST:

Geo. H. Knight;

Chas. F. Gooch

INVENTOR:

James B. Eads

By Knight Bros.

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UNITED STATES PATENT OFFICE.

JAMES B. EADS, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN DREDGING-MACHINES.

Specification forming part of Letters Patent No. **208,894**, dated October 15, 1878; application filed November 12, 1877.

To all whom it may concern:

Be it known that I, JAMES B. EADS, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Dredging Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My improvement consists in an apparatus which is pushed along the river or other ground to be dredged, and whose fore end is supported on a broad tread-wheel or roller, whose vertical position relatively to the plows governs the depth to which the plows enter the ground. The position of the plows relatively to the roller is governed by a hydraulic ram, whose plunger is secured to the movable lower part of the suction-pipe, to whose lower end the plows are attached, the cylinder of the ram being attached to the suction-pipe above such movable part. In connection with the ram are a force-pump and a safety-valve, the former to force the required quantity of water into the cylinder, and to maintain therein a fixed pressure, and the latter to allow the retreat of the plunger on the plows coming in contact with an immovable obstacle.

The plunger of the ram is regulated in its position by a throttle-valve in the supply-pipe of the ram-cylinder and an escape or safety valve, so that the depth of the cut can be determined and controlled.

Attached to the movable (lower end) of the suction-pipe is a small plunger, which enters a cylinder attached to the fixed part of said pipe; and in connection with the interior of this cylinder is a hose or other pipe, terminating at the upper end in a vertical open-topped glass tube, to indicate by the surface-level of the water in the glass tube the position of the plunger in its cylinder, and consequently the relative position of the lower and movable part of the suction-pipe to the upper part, and also the position of the plows relatively to the roller.

The lower part of the suction-pipe is supported and guided by side timbers, which are attached to the upper part of the pipe, the lower part working on anti-friction rollers, bearing against the bottom and top of said timbers. The ground-roller has shaft-bearing in the upper and forward ends of side levers, which are connected to the side timbers by connecting-straps, and also pivoted to the lower end of the suction-pipe. The construction is such that, on the backward movement of the plows relatively to the guide-timbers, the plows and timbers ascend relatively to the roller. Thus when the plows come in contact with an immovable obstacle the water escapes from the ram-cylinder through the safety-valve. When the plows have passed the obstacle the water will again be forced into the ram-cylinder, to restore the plows to their working position. The weight of the parts will also tend to restore them to this position. The indicator or gage, before referred to, will indicate when the parts have reached this position.

The outer ends of the side timbers may be supported, when the dredge is not working, by a chain or cable passing beneath a grooved roller between the timbers, and this device may be used to raise the working parts from the water when required.

In the drawings, Figure 1 is a perspective view of the apparatus. Fig. 2 is a side view, partly in vertical section, axial to the suction-pipe. Fig. 3 is a plan, partly in section, with the parts before the plows removed. Fig. 4 is a detail view, showing the force-pumps and their operating mechanism for supplying the ram-cylinder with water.

A A are timbers firmly secured to the upper part, B, of the suction-pipe, which is connected at the upper end to the dredge-boat by a universal pipe-joint, preferably such as is described in the patent issued to me April 10, 1877, No. 189,436. The upper part, B, of the suction-pipe communicates with a sand-pump, to cause, by suction, the upward passage of the earth and water through the suction-pipe B D. The sand-pump is not shown, because I claim no novelty in the same.

D is the lower part of the suction-pipe, which works endwise in the lower end of the upper part by a slip-joint, C. The part D has brackets E E and F F, carrying, respectively, anti-friction rollers G G and H H, which bear, respectively, upon the upper and the under side of the timbers A A, the part D being guided in its endwise movements by the slip-

joint C and side timbers, A A. The part D expands laterally toward the lower end, where it terminates upon the under side in a gang of plows, I I, which raise and break up the earth, and favor the mixing therewith of the necessary water to lubricate the mass in its upward passage through the suction-pipe.

The ground-roller J turns on gudgeons or shaft K, having bearing in the side levers, L. Plates *a* extend forward from these levers, covering the lower part of the ends of the roller J, to prevent mud or other matter entering with the water into the interior of the roller. The side levers extend backward to the suction-pipe behind the plows, to which pipe they are connected by pivot-pins *c*. The lower edges of the levers L are so constructed as to form cutters to penetrate the earth, and are inclined, as shown, so as to surmount any hard obstacle in their course and carry the plows over it. These levers L are connected by a hollow triangular beam, N, which forms a strong brace between them, and whose front side is concave and is nearly in contact with the roller J.

b are side plates extending backward from the levers L, to prevent lateral currents entering above the plows and lessening the vertical current, whose course is shown by arrows, and which is driven down into the suction-pipe by atmospheric pressure induced by the vacuum-pump. The plates *b* are connected together by a plate, M, and to this is attached (by its upper edge) a hinged gate or plate, P.

The water-passage through which the water enters the pipe D is open at top, and extends downward, as indicated by arrows, between the sides plates, *b*, at the sides, and between the roller J and beam N at the front and plate M and hinged gate P at the rear. The narrowest part of the passage is between the beam N and the hinged plate or gate P, and this part is adjusted in size by the movement of the gate to regulate the amount of water entering the suction-pipe.

The ends of the timbers A A are connected to the side levers, L, by connecting-straps Q Q, whose ends are pivoted to the timbers and levers respectively.

S is the plunger of a hydraulic ram, said plunger being attached to the part D of the suction-pipe. T is the ram-cylinder, attached to the upper part, B, of the suction-pipe. It will be obvious that the amount of water in the cylinder, and consequent position of the plunger S, will regulate the position of the part D of the suction-pipe relatively to the part B of the same.

U is a pipe supplying the ram-cylinder T with water, the water in the cylinder being under sufficient pressure to hold the plows I in the forward and working position. In the water-supply pipe U is a valve, U′, (see Fig. 4,) similar to the safety-valve of a steam-generator, which is weighted, so as to retain the water until a given strain comes upon the plows, and then to rise and allow the escape of water from the cylinder T and the retreat of the plows. This takes place when an extreme strain comes upon the plows in the event of their coming in contact with an immovable obstruction, so that in such a case the plows will not be carried forward with the boat, but will retreat upward as the plunger S is forced back into the cylinder T. The relative position of the roller in this contingency is shown by dotted lines in Fig. 2.

u is a throttle-valve in the pipe U, in reach of the operator, enabling him to open communication between the force pump or pumps u^1 and the cylinder T. u^2 is a steam-engine, operating the force-pumps. It is preferred that the relative area of the steam and pump pistons should be such that, on the throttle-valve being left open, the resistance of the safety-valve would be a little in excess of the steam-pressure upon the piston, and consequently, when the water in the pipe U had reached the desired pressure for the operation of the plows, the power of the steam would be counterbalanced and the engine would come to rest. Then, on the escape of any water through the safety-valve, and when the plows have passed that obstruction, so that the abnormal pressure has been removed from the plows and the safety-valve has closed, the engine shall go into operation and supply water to take the place of that which has escaped through the safety-valve.

I do not claim the combination of engine u^2, pump u^1, and pipe U as new, but merely describe it as the preferred means of automatically restoring the plows to their working position, and retaining them in this position until an extreme strain is brought upon them.

The connection of the lower end, D, of the suction-pipe with the ground-roller J is such that outward movement of the plunger S and extension of the joint C depresses the plows relatively to the roller, and increases the depth to which the plows cut, and thus by means of the ram S T the depth of the cut is regulated. The water may be allowed to escape from the cylinder T by a hand-valve in reach of the operator, said valve being opened to allow the retreat of the plunger to reduce the depth of the cut; or the safety-valve U′ may take the place of a hand-valve, and be opened by the hand of the operator for the above purpose.

The atmospheric pressure and the friction of the matter passing through the part D of the suction-pipe tend to cause the pipe D to retreat into the fixed part B.

It will be observed that the movement of the plate M upon the part D of the pipe is upon the pivots *c*, and consequently the lower edge of the plate M would not remain during these movements in the proper close contact with the pipe D without some special provision were made. This is provided for by a curved plate, *d*, extending from side to side of the pipe and concentric with the pivots *c c*, so that in all the changes of movement of the plate M upon the pipe D the lower edge

of the plate M will nearly or quite touch the plate *d*.

I will now describe my device for indicating to the operator upon the boat the position of the part D of the suction-pipe relatively to the upper part, B, of the same pipe. This device consists of a small hydraulic cylinder, V, attached to the upper part, B, of the suction-pipe, and a plunger, W, working in said cylinder and attached to the lower part, D, of said pipe. The position of the plunger in the cylinder, it will be seen, will be governed by the position of the slip-joint C.

To indicate the position of the plunger W, I provide a flexible pipe or hose, X, communicating at the lower end with the interior of cylinder V, and extending up to within view of the operator, where it connects with the lower end of a vertical open-topped glass tube, Y, the arrangement being such that when the plunger W is in its outer position the surface-level of the water is near the lower end of the indicator X, and as the plunger is forced into the cylinder the water rises in the indicator.

The flexible pipe X may be attached to the suction-pipe, and by it let up to the universal joint, and from thence to any convenient part of the boat, where the glass tube Y may be continually under the eye of the operator.

I desire it to be understood that I do not confine myself to the apparatus herein described for supplying water to the ram-cylinder, as any suitable force-pump may be used for this purpose.

Extending transversely from timber A to timber A upon the other side is a cross bar or brace, *e*, against which the brackets or standards E E impinge as the plows I and end D of the suction-pipe descend; and by this construction the descent of the plow is arrested and limited.

In the operation of my dredge-boat the lower end of the suction-pipe is carried and supported by a cable or chain passing beneath the pulley or wheel R when the boat is in deep water, the plows being sustained at the depth to which it is determined to dredge. Then when the roller J reaches a shallow place it rolls upon the ground-surface, and the plows remove a stratum therefrom. When this shallow place is passed over and deeper water reached the end of the suction-pipe is again sustained by the cable passing beneath pulley or wheel R.

I claim herein as my invention—

1. The inclined suction-pipe consisting of part D, provided with a cutting implement and connected to the part B by a slip-joint, C, whereby the part D is permitted to yield upon encountering any obstacle, substantially as set forth.

2. The combination, with the parts B D of the suction-pipe, of the hydraulic ram S T, substantially as and for the purpose set forth.

3. The combination, with the parts B D, of the indicator V W X Y, substantially as set forth.

4. The combination, with the suction-pipe B D, of the broad wheel or roller J, supporting the end of the suction-pipe, substantially as set forth.

JAS. B. EADS.

In presence of—
SAML. KNIGHT,
R. S. ELLIOTT.