No. 635,890. Patented Oct. 31, 1899.

S. A. HILL.

DREDGING MACHINE.

(Application filed May 6, 1899.)

(No Model.) 4 Sheets—Sheet 1.

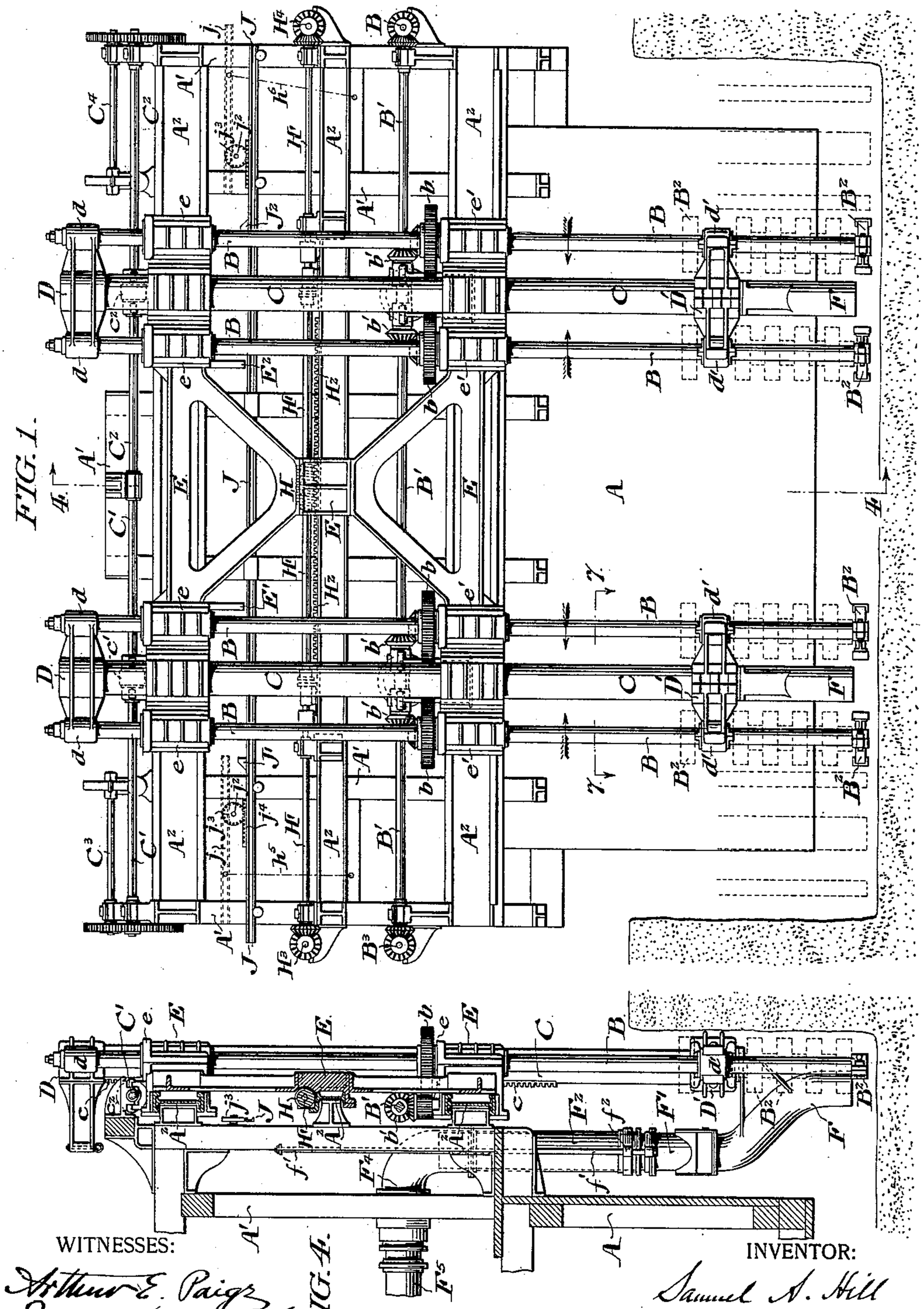

FIG. 1.

FIG. 4.

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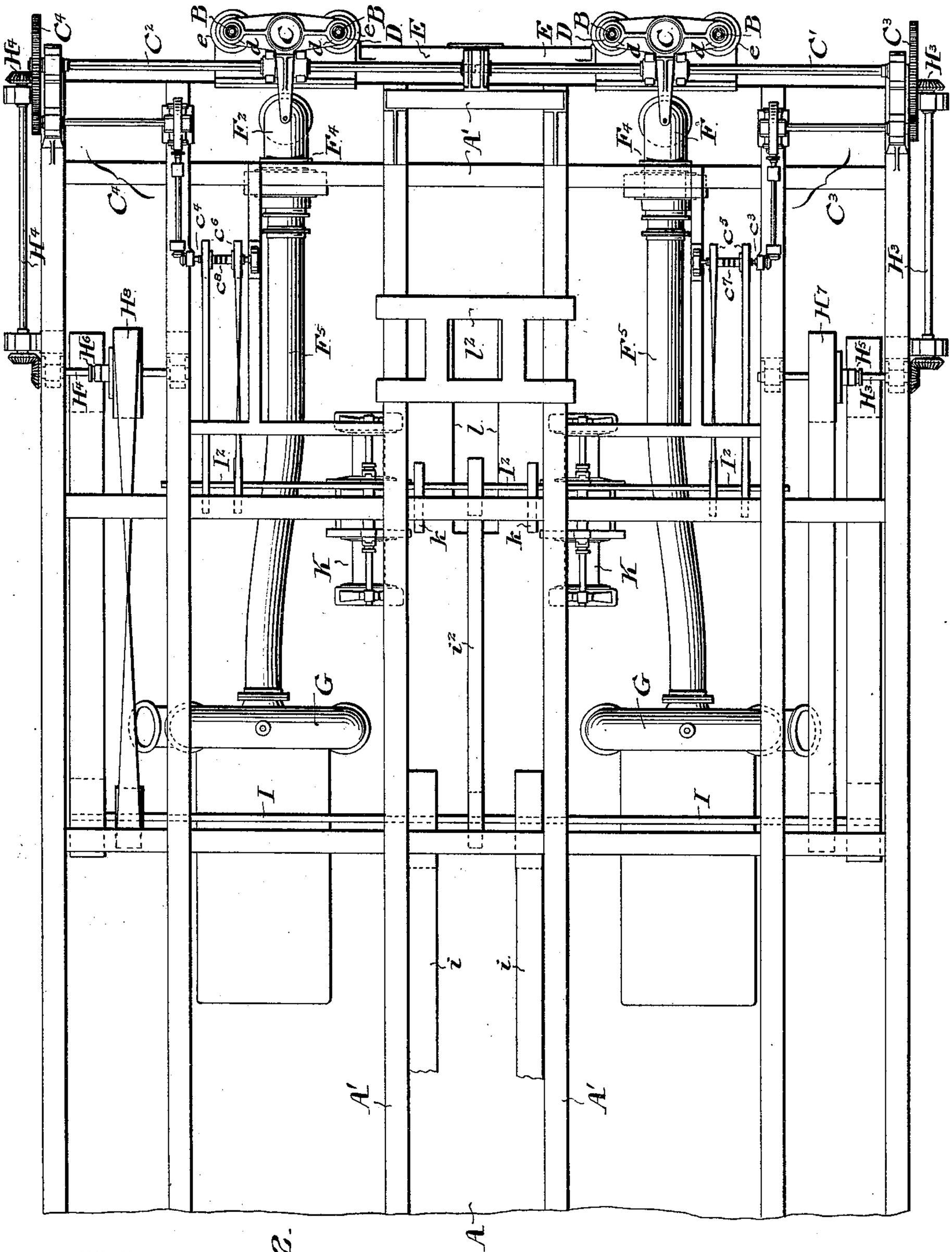

FIG. 2.

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(No Model.) 4 Sheets—Sheet 3.

FIG. 3.

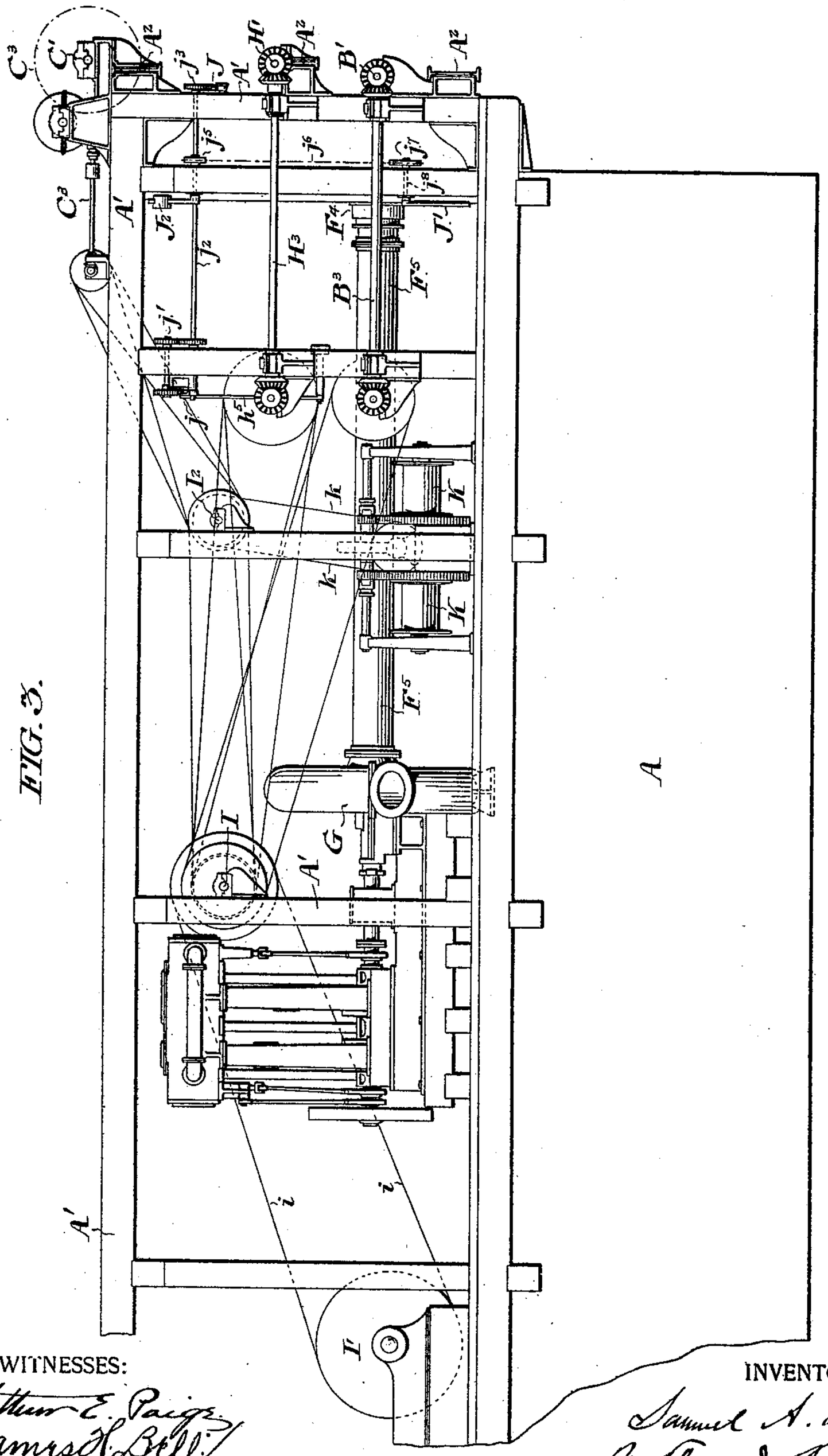

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FIG. 5.

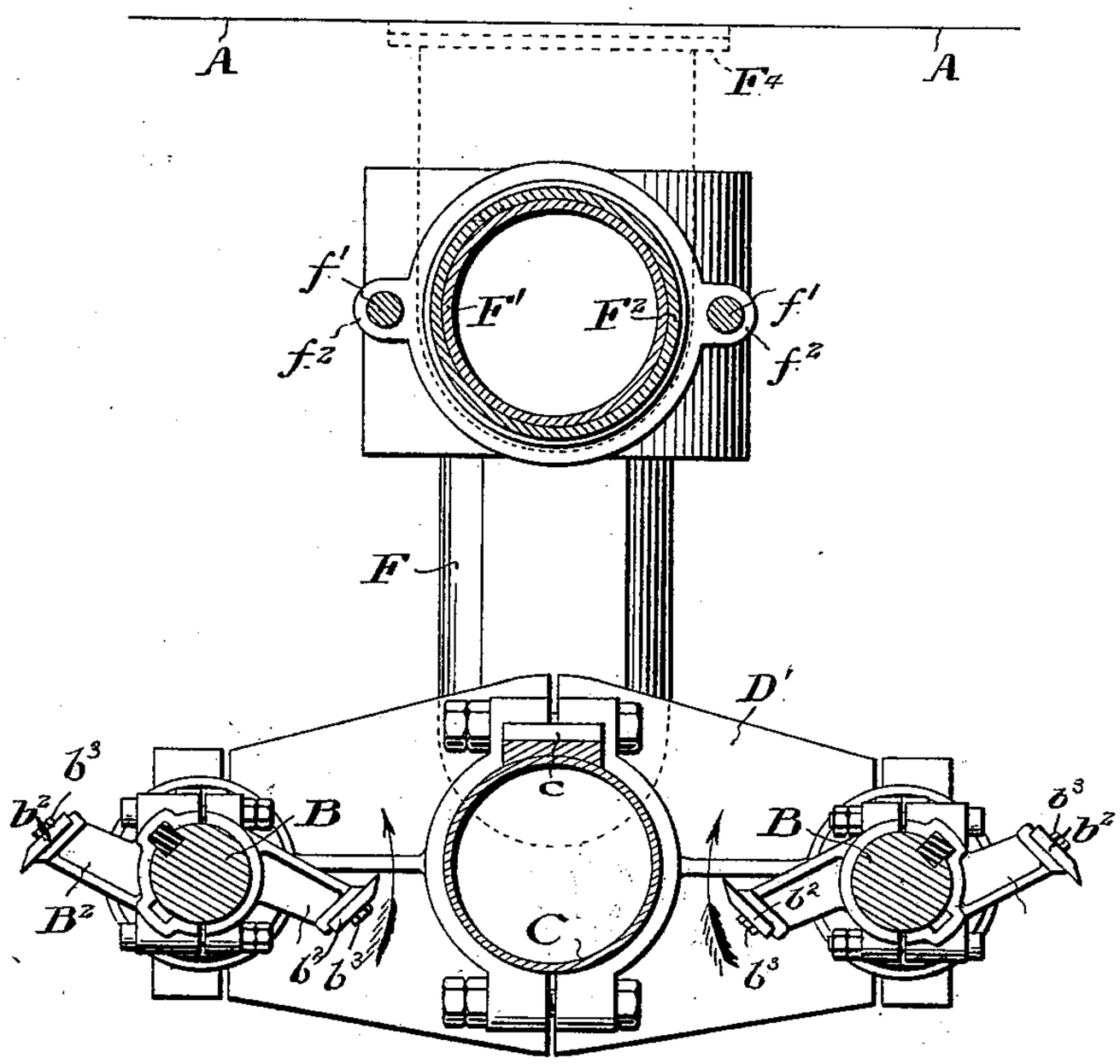
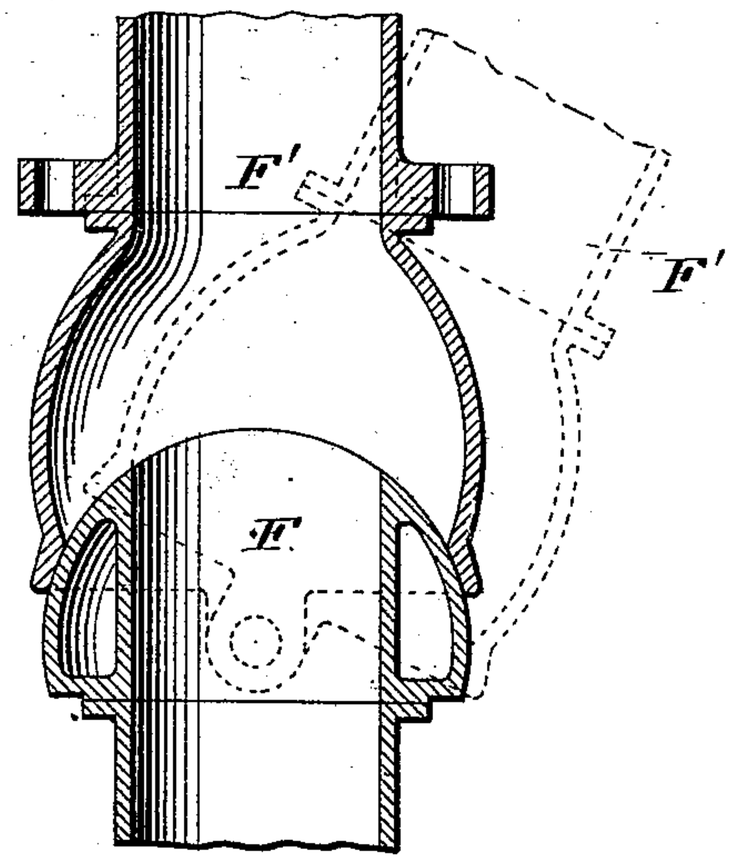


FIG. 6.



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UNITED STATES PATENT OFFICE.

SAMUEL A. HILL, OF ATLANTIC CITY, NEW JERSEY.

DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 635,890, dated October 31, 1899.

Application filed May 6, 1899. Serial No. 715,780. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL A. HILL, of Atlantic City, in the State of New Jersey, have invented certain new and useful Improvements in Dredging-Machines, whereof the following is a specification, reference being had to the accompanying drawings.

My present invention relates to the class of dredging-machines wherein a vertical shaft provided with cutters is combined with means whereby said shaft may be simultaneously revolved and caused to traverse back and forth upon the front of a hull which supports its actuating mechanism.

Letters Patent of the United States, No. 554,510, were granted to me under date of February 11, 1896, for a dredging-machine of the type specified. My present improvements may, perhaps, be best understood by referring to the characteristics of the structure shown and described in said patent. Therein a pair of counterpart shafts are separately mounted upon a frame wherein said shafts are revolved in the same direction, said separate shafts being respectively accompanied in the to-and-fro movement of said frame by respective oscillating suction-pipes, the intake ends of which rise and fall through yokes behind said shafts, so that the relative position of said pipe ends and their respective shafts vary throughout the extent of their transverse movement, and the relation of said shafts and pipes is such that each of the former delivers the material dislodged from the embankment to one side of its pipe, so that the latter cannot directly receive said material. In said structure the vertical extent of the cutting-shafts presented against the embankment to be removed is determined by the adjustment of said shafts in said frame before the latter is operated, and such adjustment cannot be effected during said operation.

My present improvements comprise means whereby a shaft of the character described may be vertically adjusted during its movement of revolution and transverse progression, its respective motions of revolution, transverse progression, and vertical adjustment being independent and separately controllable by the operator and being also permitted without changing the position of the pumping device.

My present improvements also comprise the grouping of a pair of shafts oppositely revolved, so as to deliver the material thereby loosened directly to the intake end of a suction-pipe, which is located between said shafts and in fixed relation therewith, the oscillatory movement of each suction-pipe being provided for by telescoping sections between its opposite fixed extremities, as hereinafter specified, so that regardless of the position of said shafts in transverse progression or vertical adjustment the relative position of the intake end of the accompanying suction-pipe remains the same.

In my present invention I further provide certain improvements in the form of the cutters mounted upon said shafts, in the form of the framework upon which the cutting-shafts are supported, in mechanism for actuating said shafts, and other details of construction hereinafter more particularly specified.

In the accompanying drawings, wherein I have shown a convenient embodiment of my invention, Figure 1 is a front elevation of the hull, showing the dredging-machine mounted thereon. Fig. 2 is a plan view of the mechanism shown in Fig. 1, and Fig. 3 is a side elevation thereof. Fig. 4 is a sectional view taken on the line 4 4 of Fig. 1. Fig. 5 is a plan sectional view on the line 7 7 in Fig. 1. Fig. 6 is a sectional view of the joint between the fixed intake extremity of the suction-pipe and the oscillating portion thereof.

In said drawings, A is the hull of the dredge, upon and within the superstructure A′ of which is mounted the mechanism to actuate the cutting-shafts B B. Said cutting-shafts B are arranged in pairs, respectively supported throughout their length by means of the hollow columns C, to which they are yoked by brackets D D′, fixed upon said columns. The shafts B revolve freely in the bearings *d d′* of said brackets and in the bearings *e e′* upon the frame E, and said shafts and columns are adjustable in the direction of their length through said bearings *e e′*, as hereinafter described. Said columns C also support the intake-terminals F of the suction-pipes, which are secured beneath the brackets D′ in fixed relation with and between the shafts B B, each of the fixed intakes F being

coupled with an oscillating section F′ of the suction-pipe, and said sections F′ are arranged to telescope within sections F^2 of said pipe, and the latter oscillate at F^4 upon the fixed horizontal sections F^5, which extend to the suction-pumps G. (Shown in Figs. 2 and 3.) Said pumps may be mounted in any convenient manner upon the dredge, since the adjustments of the cutter are entirely independent of the pumps, thereby obviating the necessity of providing an adjustable support for the latter. The guide-rods f' upon the sections F′ slide within the bearings f^2 upon the sections F^2 and serve to maintain said parts in proper alinement.

The frame E slides upon girders A^2 and serves to carry the parts above described from side to side of the superstructure A′ to the limits indicated by the dotted lines in Fig. 1, and this motion of transverse reciprocation is imparted to said frame E by means of the worm H upon the shaft H′, which engages with the fixed rack H^2. Said shaft H′ connects at its opposite extremities with shafts H^3 H^4, and the latter are alternately actuated by the engagement of the clutches H^5 H^6 with the pulleys H^7 H^8. The pulleys H^7 H^8 are continuously rotated in opposite directions by means of suitable belt connections with the shaft I, which is in turn actuated by means of the belt i, leading to the motor-wheel I′, as indicated in Figs. 2 and 3.

The separate trains of shaft and gearing connections terminating, as aforesaid, at the opposite extremities of the shaft H′, respectively and alternately rotate the latter in opposite directions, and thus effect the transverse movement of the frame E in one direction or the other by the automatic engagement and disengagement of the clutches H^5 H^6, which are shifted by the levers h^5 h^6. (Diagrammatically indicated upon Fig. 1.)

The automatic shifting mechanisms, comprising the levers h^5 and h^6, are counterpart upon the opposite sides of the dredge, and I will therefore limit my description to the lever h^5 and the parts connected therewith, referring to Figs. 1 and 3. Said lever h^5 is fulcrumed at its lower extremity upon the superstructure A′ and connected at its upper extremity with the rack-bar j, which by suitable gearing j' is connected with the shaft j^2, upon which is fixed the gear j^3, engaged with the rack j^4 upon the slide-bar J, as shown in Fig. 1. Said bar J is provided with bosses J′ J^2, arranged to be encountered by the projecting arms E′ E^2 upon the frame E, so that as the latter reaches the limit of its transverse movement in either direction said bar J is automatically shifted, and through the mechanism above described the clutches H^5 H^6 are respectively and alternately engaged and disengaged to effect the reverse movement of the frame E and the parts connected therewith. The shaft j^2 is provided with a sprocket-wheel j^5, connected by the chain j^6 with the sprocket-wheel j^7, and the shaft j^8 of the latter being provided with a hand-lever J′ the relation of the parts above described is such that clutches H^5 H^6 may be automatically shifted by each transverse movement of the frame E or manually shifted by the movement of the lever J′. Accidental displacement of the clutch-shifting mechanism is prevented by the weighted lever J^2, which is fixed upon the shaft j^2 and serves to retain the parts at either extreme of their movement until positively actuated.

In the normal operation of the dredge during the transverse movement of the frame E, carrying the shafts B, as aforesaid, said shafts are continuously rotated in the direction of the arrows upon Figs. 1 and 5 by means of the gears b, which are connected upon said shafts, so that the latter may slide therethrough. Said gears b are continuously actuated by the gears b', which are mounted to slide upon and rotate with the shaft B′, and the latter is continuously rotated in one direction by means of the shaft and gearing connections B^3, (shown in Fig. 3,) leading to the driving-shaft I.

The shafts B are shifted transversely and continuously rotated inwardly toward their respective intakes F by the mechanism above described, and said shafts are provided throughout the lower portion of their length with any desired number of cutter-heads B^2. As shown in Fig. 5, the cutter-heads B^2 each comprises separable sections arranged to embrace the shaft B, and each of said sections is provided with a projecting arm, upon the outer extremity of which is mounted a blade b^2 in tangential relation with the shaft B. The several cutting-blades b^2 are longitudinally adjustable with relation to the arms, said adjustment being permitted by screws b^3, mounted in the ends of the arms and passing through longitudinal slots in said blades.

In order that the vertical depth of the cutting action of the dredge may be predetermined and varied at the will of the operator during the aforesaid movements of transverse reciprocation and rotation of said shafts B B by raising or lowering the latter, together with the column C and intake F coupled therewith, I provide the rack c upon the rear faces of the respective columns C, which, as indicated in Figs. 4 and 5, are respectively in continuous engagement with the gears c' c^2. Said gears c' c^2 are respectively in rotative engagement with the shafts C′ C^2, but are journaled upon the bearings e e, so as to be reciprocated transversely with the frame E. Said shafts C′ C^2 may be independently rotated in either direction by the counterpart shaft and gearing trains C^3 C^4, respectively connecting with the outer ends thereof. Upon the shafts c^3 c^4, comprised in said trains, are loosely mounted respective pairs of belt-wheels c^5 c^6, and the individual wheels comprising the said pairs c^5 c^6 are continuously rotated in opposite di-

rections by suitable belt connections with the shaft I^2, the latter being counter to the shaft I and rotatively connected therewith by the belt i^2, as indicated in Fig. 2. Upon the shafts c^3 c^4 are respectively keyed the clutch-sleeves c^7 c^8, and the arrangement of the parts is such that said shafts and clutches are normally stationary, the latter occupying a position intermediate of the oppositely-driven belt-wheels c^5 c^6. However, said clutches c^7 c^8 are provided with hand-levers or any other convenient mechanism whereby they may be engaged with either of their oppositely-driven belt-wheels and the respective shafts c^3 c^4 be thereby independently actuated to effect the raising or lowering of either of the groups comprising the respective racks *c*, column C, shafts B, and suction-intakes F, coupled therewith.

It is to be noted that the arrangement of the mechanism for effecting the vertical adjustment of the shafts B and associated parts, as above described, is such that the two groups of shafts B, &c., (shown in Fig. 1,) may be independently raised or lowered at the will of the operator, and the said movement of vertical adjustment is wholly independent of the movements of rotation and transverse reciprocation of said shafts, but may be effected simultaneously therewith.

Referring to Fig. 2, K K are drums revoluble at will by means of belt connections *k k* with the shaft I^2. Upon said drums K are wrapped cables which extend through suitable guides and are anchored at their extremities, so that the advance of the dredge may be effected by rotating said drums. The rotative movement of said drums K is of course governed in accordance with the rapidity of the cutting action of the shafts B, so as to continuously present the cutters B^2 against the embankment to be removed. Such an arrangement is described in my patent hereinbefore referred to and forms no part of the present invention.

I do not desire to limit myself to the precise details of construction which I have shown and described, as it is obvious that various modifications may be made therein without departing from the spirit of my invention.

I claim—

1. In a dredge, the combination of a pump mounted thereon; a suction-pipe vertically movable with relation to said pump; a revoluble cutting-shaft; means for revolving said shaft; means for transversely reciprocating said shaft with relation to the pump; and means to adjustably shift said shaft in the direction of its length and with relation to the pump, whereby the described adjustment of the cutters with relation to the dredge may be effected without moving the pump, substantially as described.

2. In a dredge, the combination with a pump mounted thereon of a plurality of pairs of revoluble cutting-shafts; means to revolve said shafts; means for transversely reciprocating said shafts in pairs with relation to the pump; means to adjustably shift said shafts in pairs in the direction of their length and with relation to the pump; and means whereby the adjustment of the respective pairs of said shafts may be independently controlled, substantially as set forth.

3. In a dredge, the combination with a suction-pipe, of a pair of cutting-shafts arranged to revolve in opposite directions toward said pipe, substantially as set forth.

4. In a dredge, the combination with a suction-pipe, comprising an oscillatory telescoping section, a non-oscillatory intake extremity and a fixed outlet extremity, of a supporting-column for said intake, substantially as set forth.

5. In a dredge, the combination with a suction-pipe, comprising oscillatory telescoping sections, a non-oscillatory intake extremity, and a fixed outlet extremity, of a supporting-column for said intake, and a pair of cutting-shafts mounted to revolve in opposite directions toward said intake in bearings upon said column, substantially as set forth.

6. In a dredge, the combination with an oscillatory suction-pipe, provided with a non-oscillatory intake extremity of a supporting-column for said intake, a pair of cutting-shafts mounted to revolve in opposite directions in bearings upon said column, and means to adjustably shift said intake, said column, and said shafts in the direction of the length of the latter, substantially as set forth.

7. In a dredge, the combination with a revoluble cutting-shaft, of means to revolve said shaft, separate trains of mechanism to transversely shift said shaft, in respectively opposite directions upon the dredge, and means to automatically engage said separate trains of mechanism to thereby alternately effect the transverse reciprocation of said shaft, substantially as set forth.

8. In a dredge, the combination with a revoluble cutting-shaft, of a cutter-head comprising separable sections arranged to embrace said shaft, arms upon the respective sections, and adjustable cutting-blades secured upon said arms in tangential relation with said shaft, substantially as set forth.

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E. REESE.