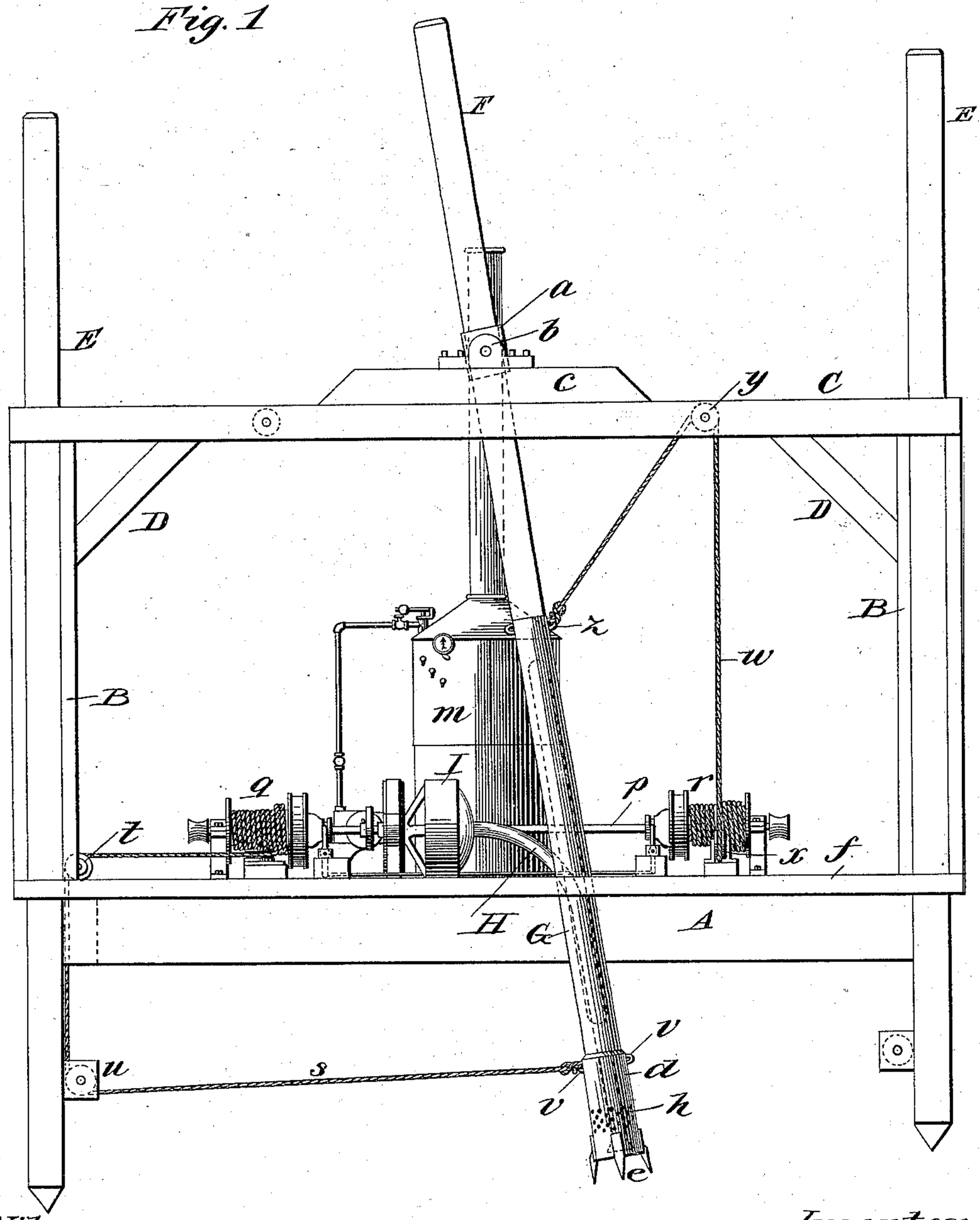
(No Model.) 3 Sheets—Sheet 1.

A. McDOUGALL.

HYDRAULIC MINING APPARATUS.

No. 547,496. Patented Oct. 8, 1895.

Fig. 1



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HYDRAULIC MINING APPARATUS.

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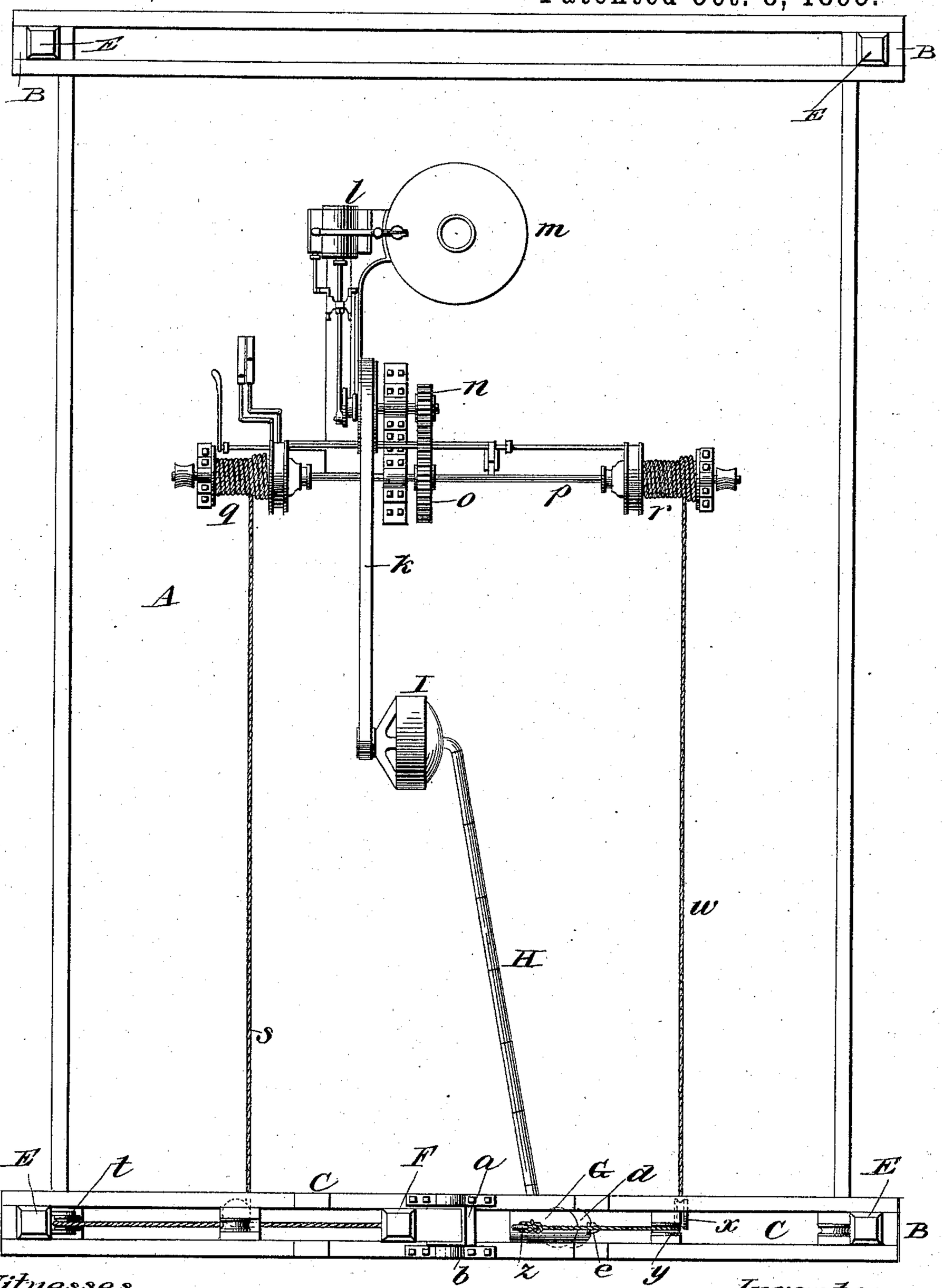

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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HYDRAULIC MINING APPARATUS.

No. 547,496. Patented Oct. 8, 1895.

Fig. 4

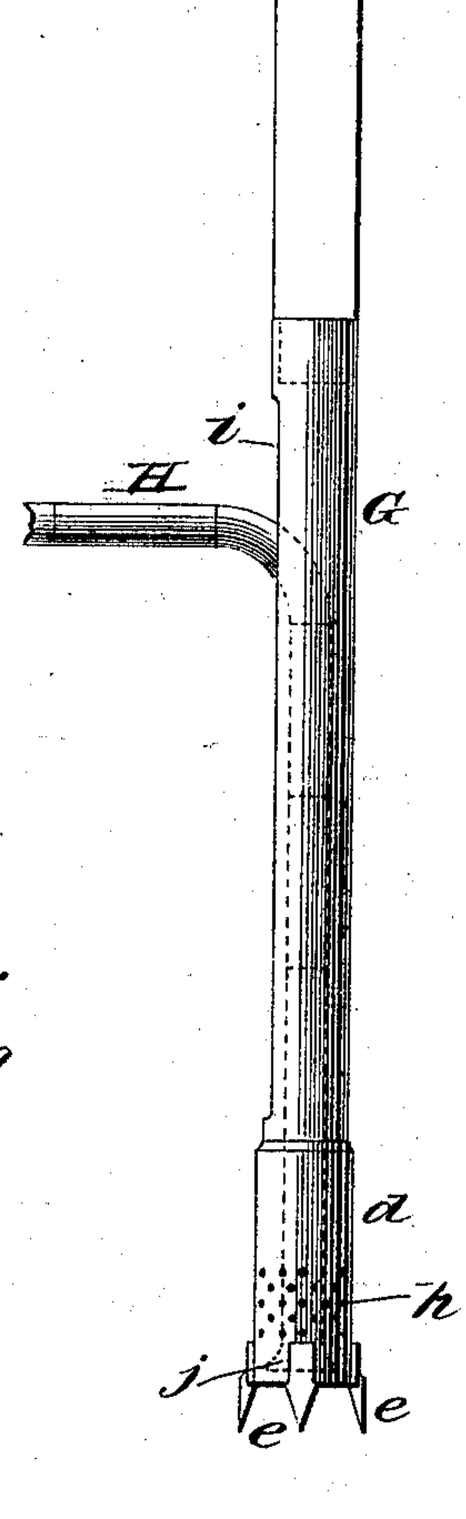


Fig. 5

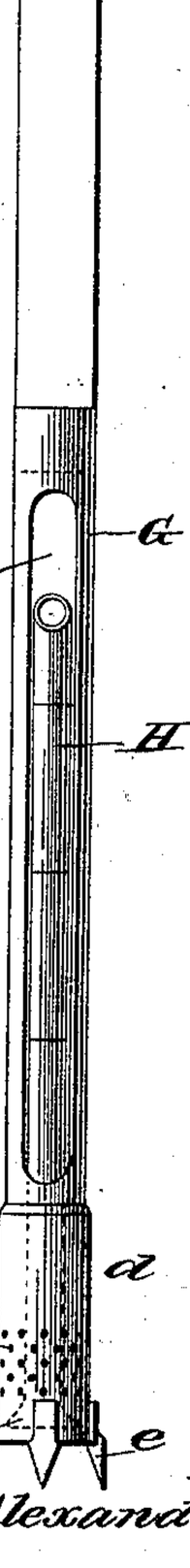


Fig. 3

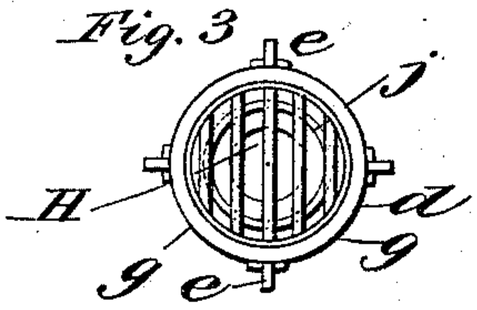
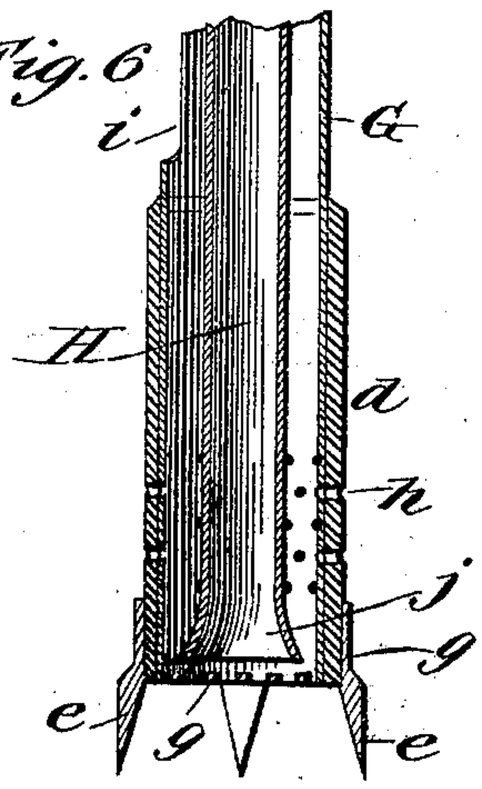


Fig. 6



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UNITED STATES PATENT OFFICE.

ALEXANDER McDOUGALL, OF DULUTH, MINNESOTA.

HYDRAULIC MINING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 547,496, dated October 8, 1895.

Application filed May 16, 1895. Serial No. 549,588. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER McDOUGALL, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Hydraulic Mining Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a new and improved dredging apparatus which is particularly adapted for the mining of sand and gravel containing gold and other precious metals. In Patent No. 531,740, granted to me January 1, 1895, for a method of and apparatus for mining gold and other metals I described and claimed an improved apparatus and method for dredging this kind of material. I had found that in many of the rivers of the northwestern parts of this country there were large deposits of sand and gravel, rich in gold, but which were so commingled with rocks and bowlders or else were packed so tightly as to make it impracticable to successfully dredge the same by means of centrifugal pumps. I therefore invented the process described in that patent of first removing from the bottoms of such rivers these obstructions, or else in first loosening the sand and gravel from the hard-packed bank and then removing the sand and gravel by means of a centrifugal pump. In this way I was enabled to successfully work in localities which had been abandoned by reason of the difficulties of working them by former processes.

My present invention relates to an apparatus for carrying out the substantial method described and claimed in that patent; but instead of performing the operation of removing the obstructions or loosening the sand or gravel prior to the removal of the gold-bearing material I perform these operations at substantially the same time, thereby materially simplifying and facilitating the work.

To this end the invention consists in providing a floating vessel adapted to be anchored over the bed of material which is to be removed, in mounting on such a vessel a dredging device adapted to be moved back and forth over the material, and provided at its lower end with heavy teeth for loosening the sand and gravel, or for removing any obstructions which may be encountered, and in providing within this dredging device a suction-pipe through which sand or gravel may be pumped by means of a centrifugal or other pump mounted on the vessel to any desired point, where it may be subsequently treated for the removal of the metal desired.

Although my invention, as explained, is preferably designed for the mining of gold or other metals from the bottoms of rivers and lakes, it may be conveniently applied for other purposes, such as for the dredging of channels in rivers and harbors which, owing to the hardness of the bottoms or to the presence of rocks, bowlders, or other obstructions, cannot be dredged by ordinary pump-dredging.

For a better comprehension of my invention, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a front elevation of the preferred form of apparatus, showing the same in actual operation; Fig. 2, a plan view of the same; Figs. 3, 4, 5, and 6, detached enlarged views of the dredging and suction device.

In all of the above views corresponding letters of reference indicate the same parts.

A represents a vessel or scow, made in any suitable way and of any desired shape. This scow may be provided with its own propelling mechanism, or it may be towed or otherwise moved to the desired localities. At each corner of this scow are heavy vertical standards B B, arranged in pairs as shown, and connecting the standards at the bow and stern are cross-pieces C C. Braces D may be employed for strengthening this structure. Mounted between each pair of standards B B is a heavy spud E, pointed at its lower end and adapted to be moved down into the bottom of the river, so as to anchor the scow firmly in place. While I prefer to employ spuds for this purpose, it is obvious that the scow may be anchored in any other way.

On the top of the braces C at the bow and stern of the scow is mounted a heavy frame *a*, in bearings *b*, which are supported on blocks

c, and movable up and down within the collar *a* is a timber F, made of any suitable shape in cross-section. It is evident that by mounting this timber in the frame, as shown, it may be swung like a pendulum back and forth toward the side of the scow, and may be moved up and down with respect to the water.

Rigidly secured to the bottom of the timber F is a pipe G, which for ordinary use may be conveniently made of about twelve inches in diameter. This pipe G is guided in its swinging movements back and forth by means of a guide *f*. At the bottom of this pipe G is a heavy cylindrical casting or pipe *d*, made, preferably, of steel and of sufficient weight for the purpose. This casting or pipe is provided at its lower end with teeth *e e* riveted, bolted, or otherwise firmly secured in place.

The bottom of the pipe G is provided with cross-bars *g g*, arranged with sufficient space between them to allow for the entrance of the sand or gravel and prevent the passage of obstructions of sufficient size to damage the pumps. Instead of these cross-bars *g*, it is obvious that a grating or heavy sieve may be made use of for the purpose.

The lower part of the pipe G and the casting *d* are perforated with openings *h* for the passage of water, sand, and gravel to the suction-pipe. The pipe G is provided at one side with a vertical slot *i* therein, extending about half the entire length of said pipe G and of sufficient width to allow for the introduction of the smaller suction-pipe. This suction-pipe H is made of some flexible material, preferably of heavy rubber tubing, or instead it may be made of short-jointed metallic sections. The lower end of this suction-pipe is provided with a bell-mouth *j*, arranged adjacent to the bars *g* or grating at the bottom of the pipe G. The other end of the suction-pipe H connects with a powerful pump or pumps I, mounted on the deck of the scow A, and of any suitable construction. This pump is operated by a belt or other connection *k* from an engine *l*, supplied with steam from the boiler *m*, carried on the deck of the scow. The shaft of the engine *l* is provided with a pinion *n*, engaging with a gear-wheel *o*, which operates a shaft *p* to which, preferably, two windlasses *q* and *r* may be connected by any suitable form of clutch when desired.

The windlass *q* in the preferred construction operates a cable *s*, which passes over blocks *t t* on the deck of the vessel, thence over a block *u*, secured to one of the spuds E, and is connected by means of an eye *v* to the casting *d* or to the lower part of the pipe G. The other windlass *r* operates a cable *w*, which passes over a block *x* on the deck of the scow, thence up and over a block *y* on one of the cross-pieces C, and is connected to an eye *z* at the other side of the pipe G near its upper end.

The operation of the preferred form of apparatus shown in the drawings and above described is as follows: The scow is propelled or towed or otherwise moved to the desired point over the bed of sand or gravel containing the metal, and the spuds E are brought down into engagement with the river bottom, so as to anchor the scow firmly in place, as shown. The engine *l* being operated, works the pump or pumps I continuously and produces a powerful suction through the pipe H. The windlass *r* is now thrown into engagement with the shaft *p*, and operating the cable *w* elevates the pipe G, carrying with it the suction-pipe H, and moves said pipes over toward one side of the scow. The timber F swings like a pendulum in the collar *a*. The windlass *r* is now disconnected from the shaft *p*, and the weight of the pipe G and the other elements carried thereby causes the lower end of the pipe to drop to the bottom of the river into engagement with the sand or gravel. By providing a long slot *i* in said pipe G the lower end of the pipe may be lowered to any desired depth without elevating the suction-pipe H above the level of the pumps I, so that the material will be elevated by said pumps directly from the bottom of the river or lake, and by extending the cable *s* around a pulley *u*, secured to one of the spuds, the said cable will extend practically on a straight line from said pulley directly to the eye *v* irrespective of the depth of water in which the device is working. The windlass *q* is now connected to the shaft *p*, and the cable *s* being operated the lower end of the pipe G will be drawn toward the other side of the scow. The teeth *e* engaging with the material will remove any obstructions which may be encountered as said pipe is operated. When the metal-bearing sand or gravel is closely packed, these teeth tend to loosen up the material. The suction produced by the pump or pumps I will elevate the sand or gravel through the pipe H and it will be deposited at any desired point for subsequent treatment. The holes *h* in the lower part of the pipe G supply water to the suction-pipe H, so that there can be no possibility of the pump or pumps being clogged up, and by providing bars *g* or a grating at the lower end of the pipe G said pump or pumps cannot become damaged by any large obstructions. It is obvious that the lower portion of the suction-pipe H may be provided with holes therein corresponding to the holes *h*, and through which water, sand, and gravel may pass into said suction-pump.

While I prefer to make use of the construction above described, it will be obvious that many modifications can be employed without departing from the essential spirit of my invention. For example, instead of employing a cable *w* for the purpose of returning the pipe G to its operative position and at the same time elevating said pipe, a cable similar to the cable *s* may be made use of, whereby the device will operate as the pipe G swings to either side of the scow, and it will be noted that when the device is to be used solely with

material which is packed tightly and where no obstructions are encountered the bars *g* or grating may be dispensed with.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. An improved dredging apparatus, comprising a scow, a pipe G mounted in a collar pivoted in a frame-work carried on said scow so as to swing back and forth in engagement with the bottom, and be capable of vertical adjustment, means at the lower end of said pipe for removing obstructions, or for loosening tightly packed material, and a suction pipe inside said swinging pipe G, for the purpose mentioned, substantially as set forth.

2. An improved dredging apparatus, comprising a scow, a pipe G mounted in a collar pivoted in a frame-work carried on said scow so as to swing back and forth in engagement with the bottom, and be capable of vertical adjustment, a grating at the lower end of said pipe, and a suction pipe in said pipe G for the purpose mentioned, substantially as set forth.

3. An improved dredging apparatus, comprising a scow, a pipe G mounted in said scow so as to swing back and forth in engagement with the bottom, a grating at the bottom of said pipe, teeth secured rigidly to the lower end of said pipe for the purpose mentioned, and a suction pipe in said pipe G, substantially as set forth.

4. An improved dredging apparatus, comprising a scow, a pipe G mounted in said scow so as to swing back and forth in engagement with the bottom, a grating at the lower end of said pipe, teeth *e*, *e*, secured to the lower end of said pipe, a suction pipe H mounted in said pipe G with its lower end adjacent to said grating, and perforations *h* in the pipe G for supplying water, sand and gravel to said suction pipe, substantially as set forth.

5. An improved dredging apparatus, comprising a scow, a pipe G mounted in said scow so as to swing back and forth in engagement with the bottom, a slot *i* in said pipe G, and a suction pipe H mounted in said pipe G and extending through said slot, substantially as set forth.

6. An improved dredging apparatus, comprising a scow, a pipe G mounted in said scow so as to swing back and forth in engagement with the bottom, a slot *i* in said pipe G, and a flexible suction pipe in said pipe G and extending through said slot, substantially as set forth.

7. An improved dredging apparatus, comprising a scow, a pipe G mounted in said scow so as to swing back and forth in engagement with the bottom, a suction pipe H in said pipe G, and a cable *s* for swinging said pipe G in engagement with the bottom, toward one side of the scow, substantially as set forth.

8. An improved dredging apparatus, comprising a scow, a pipe G mounted in said scow so as to swing back and forth in engagement with the bottom, a suction pipe H mounted in said pipe G, a cable *s* for swinging said pipe G in engagement with the bottom, toward one side of the scow, and a cable *w* for elevating said pipe and moving the same toward the other side of the scow, substantially as set forth.

9. The combination of the scow A, a pipe G mounted in said scow so as to swing back and forth, a grating *g* at the lower end of said pipe G, teeth *e*, *e*, secured to the lower end of said pipe, perforations *h* at the lower end of said pipe, a slot *i* in said pipe, a flexible suction pipe H mounted in said pipe and extending through said slot, to the pump I connected with said suction pipe, an engine *l* for continuously operating said pump, windlasses *q* and *r* adapted to be connected with and operated by said engine, a cable *s* operated by the windlass *q* and connected with the lower end of the pipe G for moving the same in engagement with the bottom, toward one side of the scow, and a cable *w* connected to and operated by the windlass *r* for elevating and returning the pipe G toward the other side of the scow, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER McDOUGALL.

Witnesses:
A. P. WOOD,
CHAS. W. LELAND.