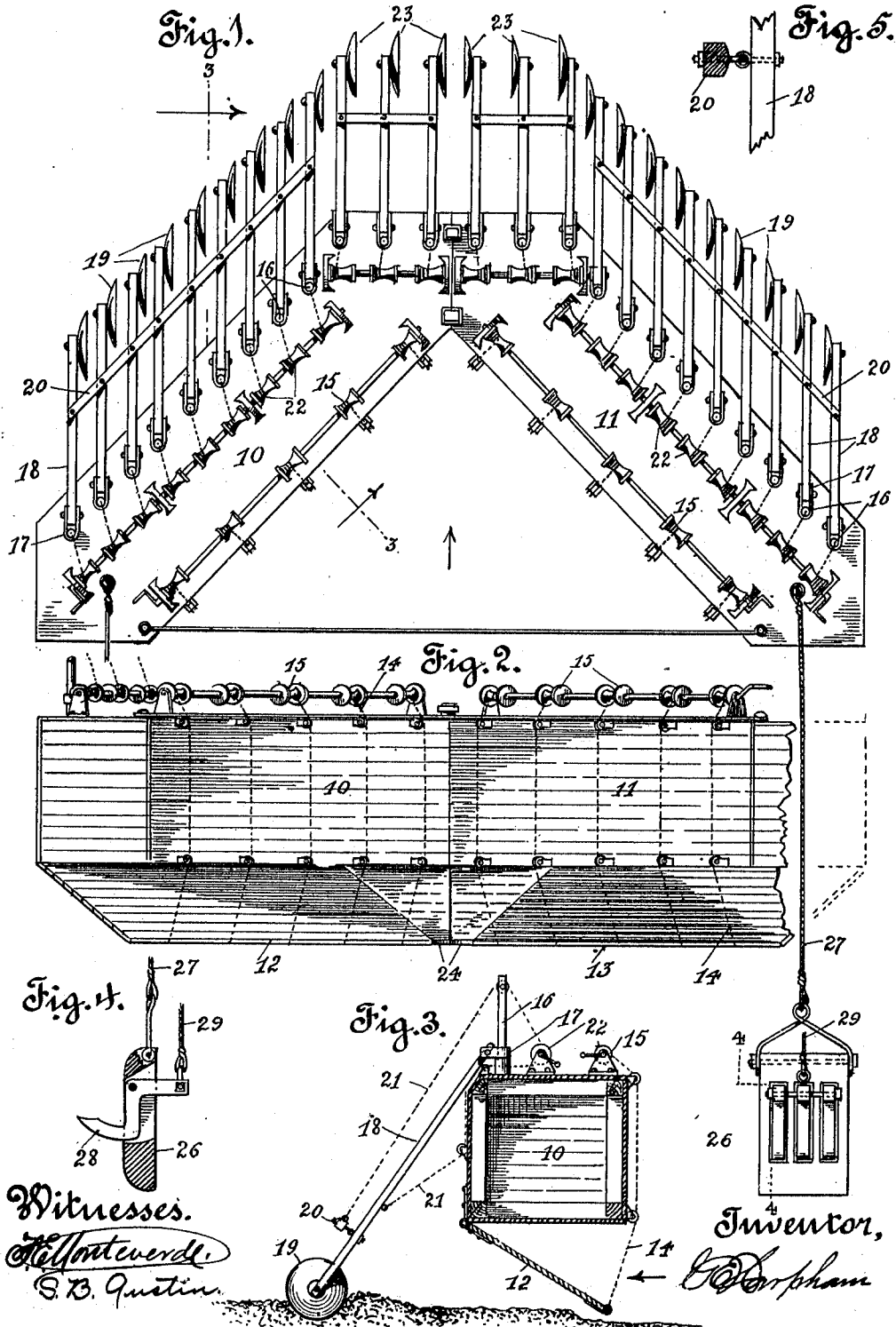


G. E. HARPHAM.
DREDGING APPARATUS.
APPLICATION FILED APR. 12, 1910.

988,466.

Patented Apr. 4, 1911.

2 SHEETS-SHEET 1.

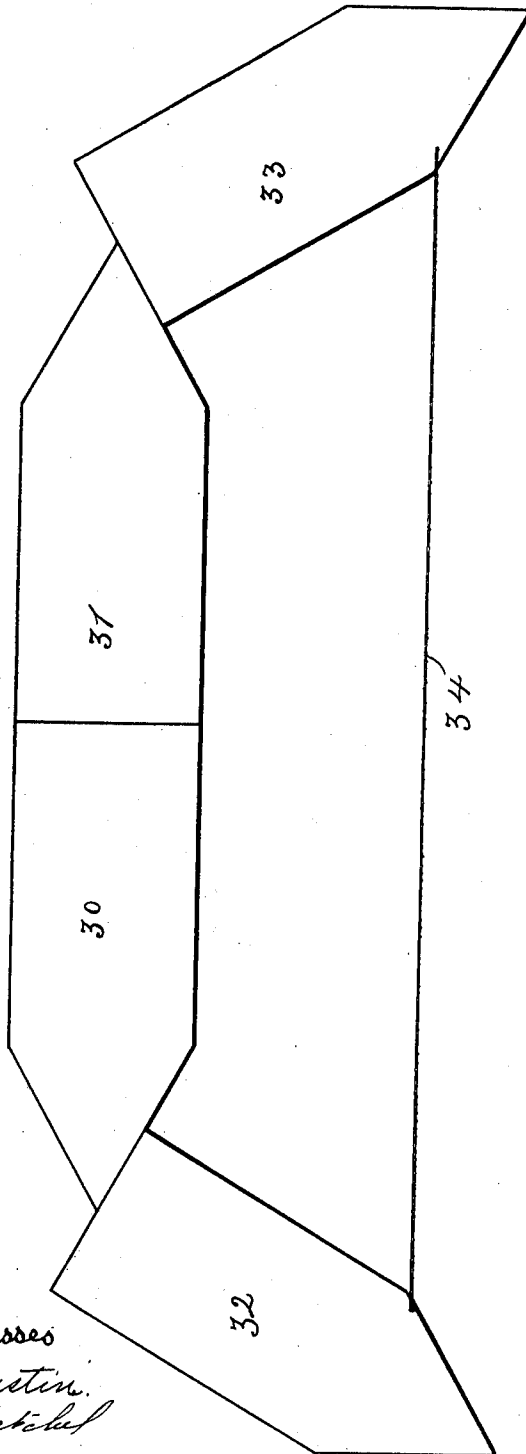


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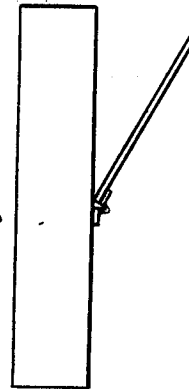
2 SHEETS-SHEET 2.

Fig. 6.



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Fig. 7.



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DREDGING APPARATUS.

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To all whom it may concern:

Be it known that I, GEORGE E. HARPAM, a citizen of the United States, residing in the city of Los Angeles, county of Los Angeles, State of California, have invented new and useful Improvements in Dredging Apparatus, of which the following is a specification.

In apparatus heretofore in use for deepening the channels of streams, it has been attempted to concentrate the volume of water flowing down the stream by means of boats so as to increase the flow or volume of water between two separated boats so that this increased flow would scour the bottom and thus deepen it.

In my improved apparatus I use a plurality of boats which operate as a moving dam to hold the water back and instead of allowing the same to pass between the boats to produce the scouring effect, I cause the same to pass under the boats and provide means in advance of the boats to break the bond of the material forming the bottom or bed of the stream, so that as the water passes downwardly under the boats it will be projected directly at the freshly broken material as it passes beyond the boat it will pick up and carry in solution a certain amount of material, and will carry it down stream and deposit it where there are deep places in the stream or will carry it to the mouth of the stream and deposit it in deep water. It will be understood that the dredging apparatus follows down stream after the detritus until the same has reached a place where the deposit will not be injurious.

Figure 1 is a plan of my improved apparatus. Fig. 2 is a rear end elevation. Fig. 3 is a section on the line 3—3 of Fig. 1. Fig. 4 is a section on the line 4—4 of Fig. 1. Fig. 5 is a detail of one of the joints in the apparatus. Fig. 6 shows a modification of arrangement of boats. Fig. 7 shows a change in the location of the bottom wings.

In the drawings 10 and 11 are large flat boats, which are preferably provided throughout their length with bottom wings 12 and 13 which are preferably hinged along one side of the bottom of the boat and are held by cables 14 either in contact with the bottom of the boat or at an angle thereto as shown in Figs. 2 and 3. These cables pass over capstans 15 mounted on the deck of the vessel.

16 are masts which are mounted on the deck of the vessel and around each mast is a clevis 17 in which is secured a beam 18 on the outer end of which is mounted a disk plow 19. These disk plow beams are preferably all connected by a cross beam 20, the connection being shown in detail in Fig. 5. Any other suitable means of connecting them may be used. The plow beams are operated by a cable 21 which passes over a capstan 22 so that the position of the plow can be regulated. The front portions of the bows of the boat are also provided with disk plows 23 and front aprons 24.

Anchors 26 are secured by cables 27 to the rear ends of the boats so as to prevent the boats from floating as rapidly as the natural current of the stream. These anchors are provided with teeth 28 which are connected together so that by means of cables 29 which run to the boats the teeth can be partly or entirely withdrawn from the soil upon which the frame-work slides, thus providing means to guide the boats in a straight line, as the course of the boats can be changed to right or left by allowing the teeth of one anchor to engage the soil more deeply than the other anchor.

In Figs. 6 and 7 I have shown a modification of the arrangement of a flotilla of boats and of the bottom wings. In this arrangement I prefer to use four or more boats in a flotilla, and to arrange two of the boats 30 and 31 at right angles to the course of the channel that is to be deepened. These boats I will call channel boats. These boats are secured together and carry the disk plows and other apparatus the same as the boats shown in Fig. 1. I also use boats 32 and 33 which are secured to boats 30 and 31 at either side thereof as shown in Fig. 6. These last boats I will call wing boats, and they are preferably angularly disposed to the line of travel of the channel boats 30 and 31. In this construction I prefer to connect the bottom wings in the center of the boat, but they may be connected to the sides as shown in Fig. 3. Boats 32 and 33 would not be provided with disk plows in this construction. They would be provided with anchors, and could be secured together with cables 34 at their outer ends. By this construction a greater damming effect can be produced than in the construction shown in Fig. 1 as the wings of the wing boats can be dropped so as to just escape the bottom

thereby causing the water coming down stream in a line with them to be deflected beneath the channel boats carrying the plows. If desired narrow boats could be
 5 constructed and ballasted so as to produce the same damming effect as is produced by the wings secured to the bottoms of the boats, but I prefer the construction of the wings as they can be readily changed while
 10 the taking in and putting out of ballast requires more time and more labor than changing the angle of the wings. Other retarding means may be employed to keep the boats going at a less speed than the current, such as
 15 wheels on the boats operated by machinery to hold the boats back, but I prefer the anchors as they will tear up the bottom and their use does not involve the use of artificial power to retard the boats. The channel boats would
 20 preferably extend across the channel to be dredged, but where a very wide channel is required it is better to use a number of flotillas in stepped relation, than to make the boats too large and unwieldy to be readily
 25 returned up the stream.

In the operation of my apparatus the boats would be taken to the upper portion of the stream that it was desired to dredge by suitable tugs and would be fastened to
 30 together in V-shape as shown in Fig. 1, or as the frustum of a cone as shown in Fig. 6, and headed down stream. While being transported to the upper reaches of the stream the plows would be carried on the
 35 deck, as they can be raised to a level of the deck and then swung around. The plows would then be lowered to enter the bed of the stream so as to turn a few inches of the same as the boats floated down
 40 the stream. The bottom wings would be lowered so as to force the water caught between the boats under such wings and into contact with the freshly broken soil of the bottom, which it would raise and carry
 45 along down the stream. The speed of the boats would be regulated so as to move enough slower than the current to give the water passing under the boat a great scouring effect, and they would be permitted to travel
 50 such distances as it was deemed advisable, which would depend upon whether the entire bed of the stream required to be lowered, or whether only reaches of the bed required deepening. If the entire bed of the stream
 55 required deepening the boats would pass to the mouth of the stream and out into deep water, thus keeping the material on the bottom of the stream moving in front of the boats. It will be understood that only a
 60 few inches of material at the bottom of the stream would be affected by any one flotilla

of boats, and that a large number of flotillas would preferably be used in order to effect the deepening of a channel quickly, and that a single flotilla could be used by passing repeatedly down the stream. By this construction boats that cost but little, and carry light draft of water can be used, as the bottom wings can be utilized to give the required damming effect to the flow of the
 65 stream and to throw it down against the bed. When the boats have reached the limit of their travel tugs are provided to return them up the stream again when the operation is repeated. 70 75

Having described my invention what I claim is:

1. A dredging apparatus for deepening the beds of streams comprising means to break the bond of the material of the bed; and
 80 means to retard a portion of the flow of the water of the stream and to direct the water downwardly against the freshly broken material of the bed, said retarding means being so arranged that the retarded water passes be-
 85 neath the retarding means.

2. A dredging apparatus for deepening the beds of streams, comprising a floating dam; means carried by said dam to break the
 90 bond of the material of the bed of the stream in advance of the dam as the same floats downwardly in the stream; means carried by the dam to cause the flow of water under the dam to pass principally under the central
 95 portion thereof and to be directed downwardly against the freshly broken material of the bed; and means to reduce the speed of the dam down the stream to a speed slower than the natural flow of the current
 100 thereof.

3. A dredging apparatus for deepening the beds of streams, comprising a plurality of boats arranged in a flotilla to form a continuous floating dam wider at the rear than at
 105 the front; disk plows carried by that portion of the flotilla which passes over the channel to be deepened, said plows being adapted to break the bond of the bed in advance of the dam; wings secured to the bottom of said
 110 boats; means carried by said boats and attached to said wings adapted to regulate and control the positions of the wings, and means to reduce the speed of the boats down the stream to a speed slower than the natural
 115 flow of the current thereof.

In witness that I claim the foregoing I have hereunto subscribed my name this 7th day of April, 1910.

GEORGE E. HARPHAM.

Witnesses:

JUSTINE OTTOFY,
 S. B. AUSTIN.