No. 875,487. PATENTED DEC. 31, 1907.

L. J. AUDOUIN, DEC'D.
E. M. AUDOUIN, ADMINISTRATOR.

MEANS FOR CAUSING AN AUTOMATIC SCOURING ACTION FOR THE REMOVAL OF SILT FROM RIVER BEDS AND WATERWAYS.

APPLICATION FILED MAR. 25, 1904.

2 SHEETS—SHEET 1.

Fig. 3.

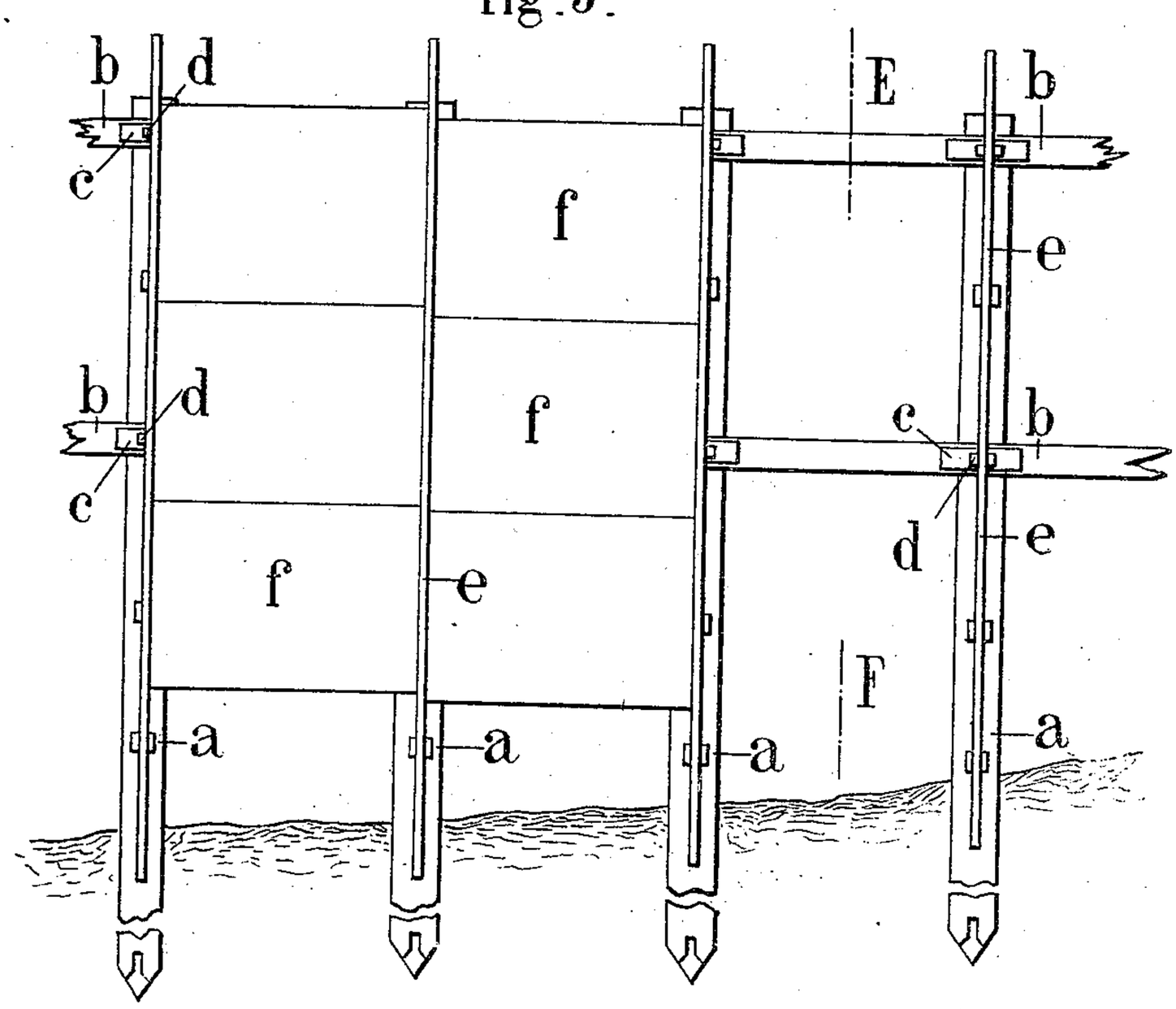


Fig. 5.

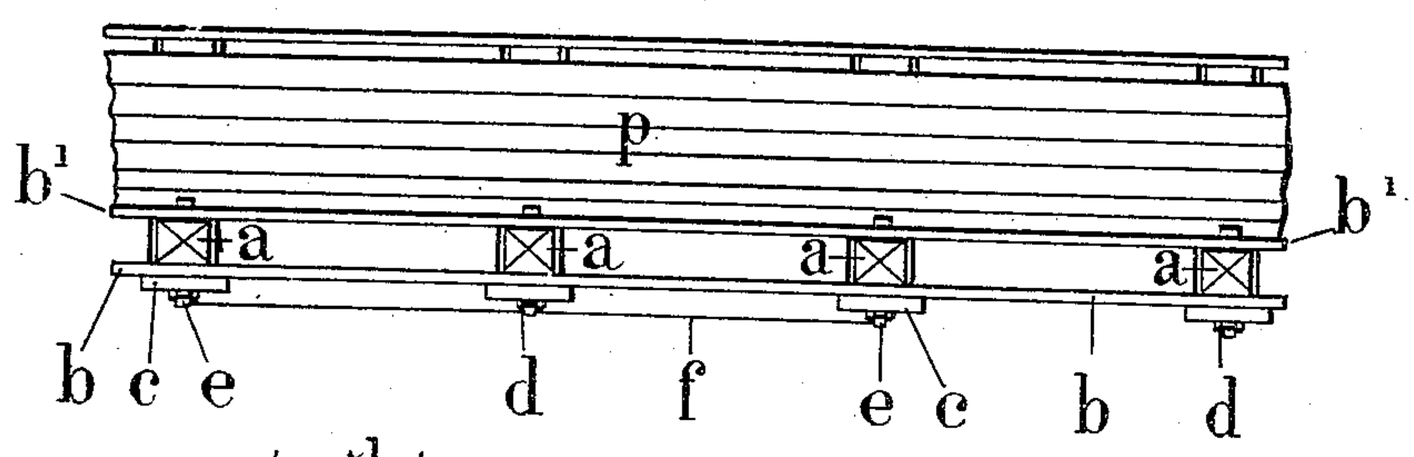


Fig. 1.

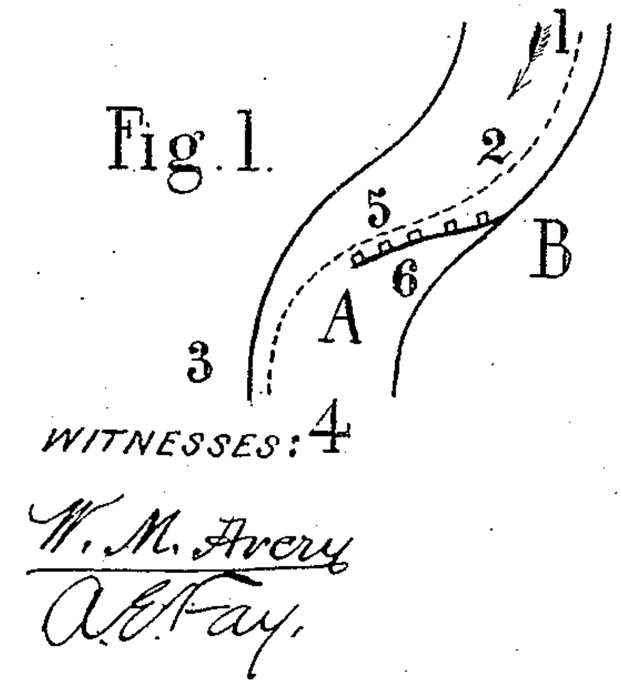
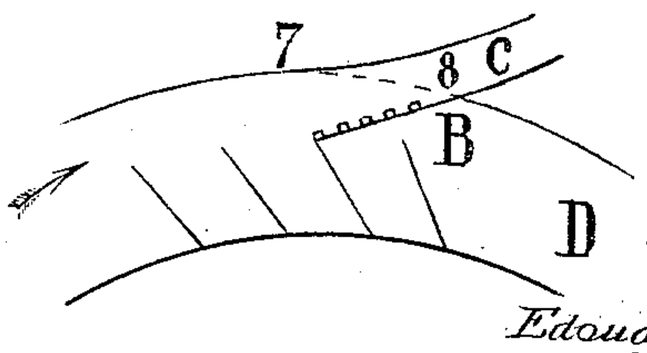


Fig. 2.



WITNESSES:
W. M. Avery
A. E. Fay.

INVENTOR
Edouard M. Audouin
Administrator of
the Estate of
Louis J. Audouin
deceased.
BY
ATTORNEYS.

No. 875,487. PATENTED DEC. 31, 1907.

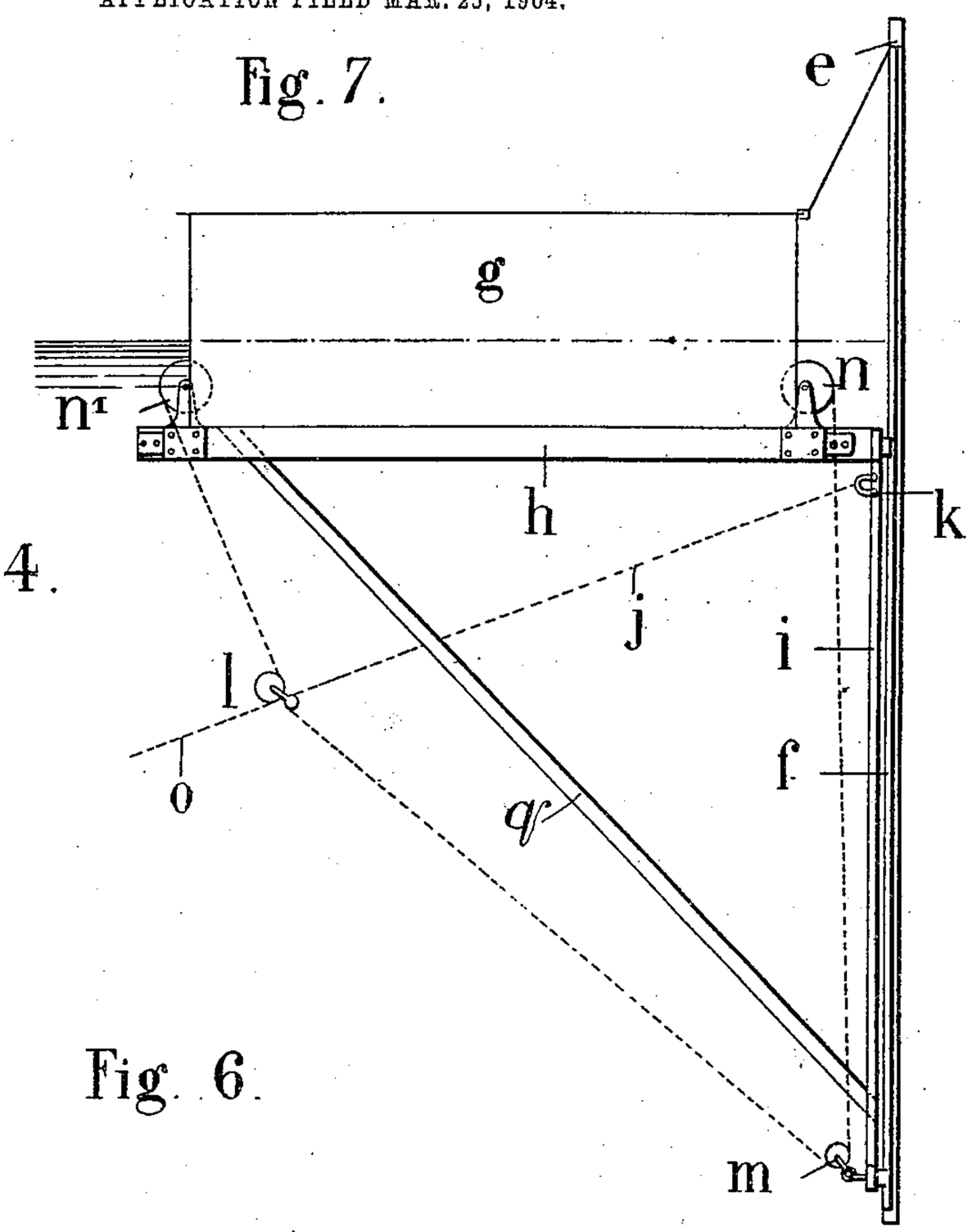
L. J. AUDOUIN, DEC'D.
E. M. AUDOUIN, ADMINISTRATOR.

MEANS FOR CAUSING AN AUTOMATIC SCOURING ACTION FOR THE REMOVAL OF SILT FROM RIVER BEDS AND WATERWAYS.

APPLICATION FILED MAR. 25, 1904.

2 SHEETS—SHEET 2.

Fig. 7.



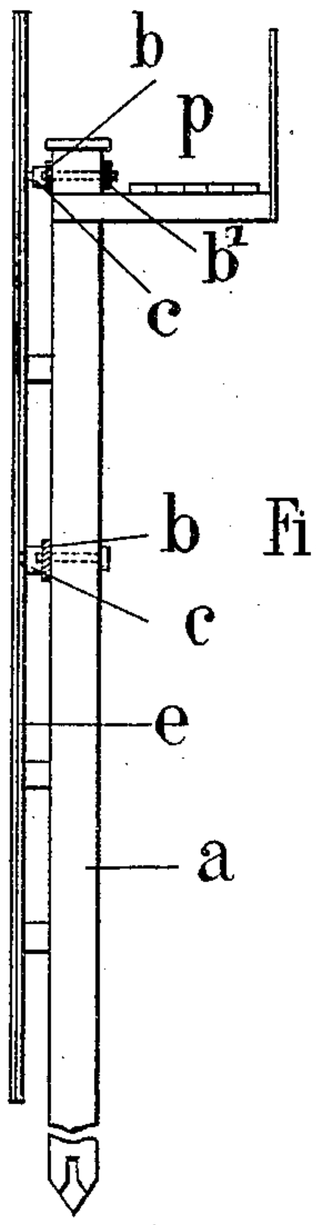
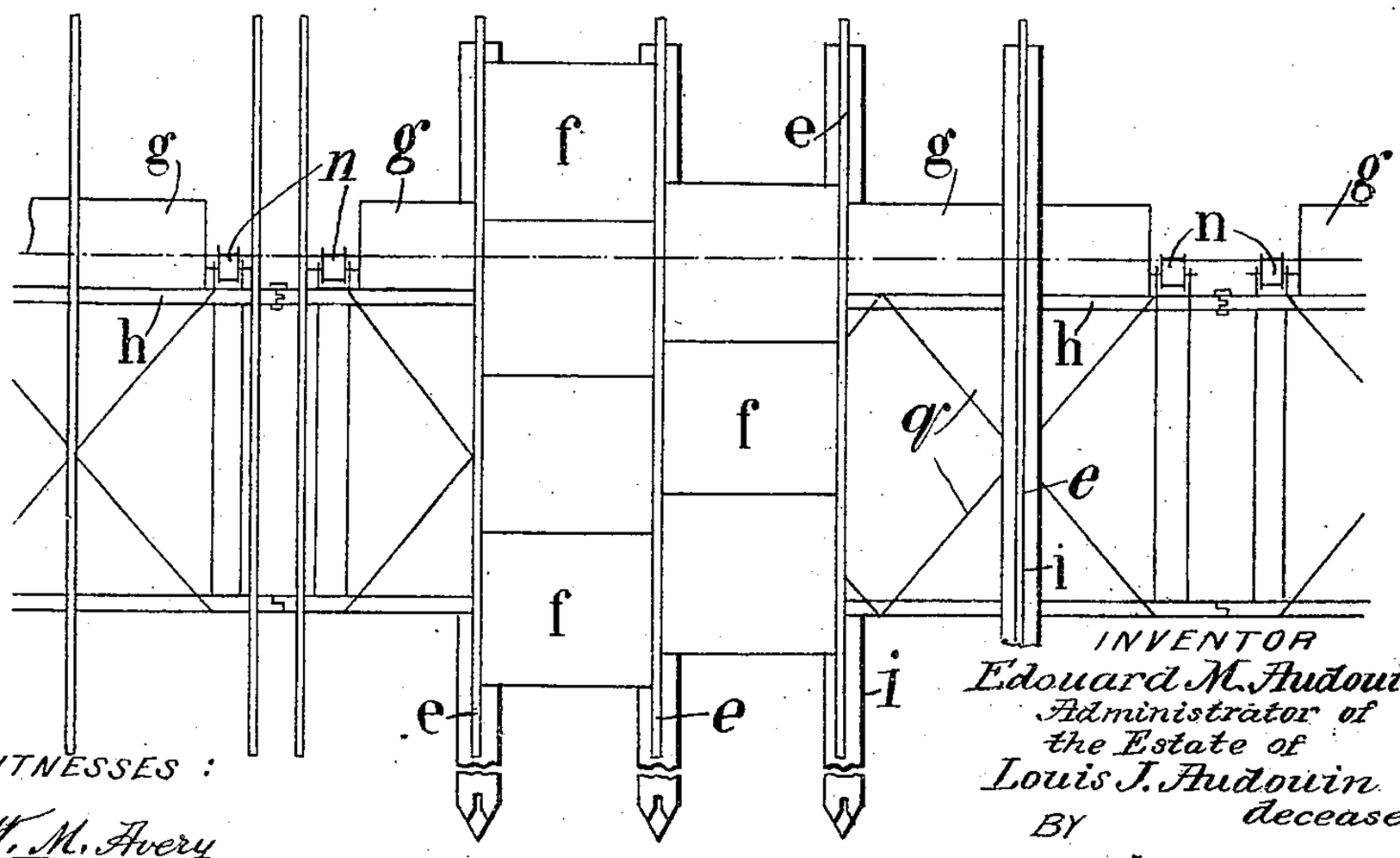


Fig. 4.

Fig. 6.



WITNESSES:

W. M. Avery
A. E. Fay

INVENTOR
Edouard M. Audouin
Administrator of
the Estate of
Louis J. Audouin
deceased.
BY

ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDOUARD MARIE AUDOUIN, OF POITIERS, FRANCE, ADMINISTRATOR OF LOUIS JOSEPH AUDOUIN, DECEASED.

MEANS FOR CAUSING AN AUTOMATIC SCOURING ACTION FOR THE REMOVAL OF SILT FROM RIVER-BEDS AND WATERWAYS.

No. 875,487. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed March 25, 1904. Serial No. 200,071.

To all whom it may concern:

Be it known that I, EDOUARD MARIE AUDOUIN, of 14 Rue Le Cesve, in the city of Poitiers, Vienne, Republic of France, professor of the Faculty of Letters of the University of Poitiers, am administrator of the estate of LOUIS JOSEPH AUDOUIN, deceased, who invented Means for Causing an Automatic Scouring Action for the Removal of Silt from River-Beds and Waterways, of which the following is a full, clear, and exact description.

This invention relates to a system of oblique barrage intended more particularly for improving rivers having shifting bottoms, the invention being characterized by the employment of adjustable suspended sluice gates for producing an automatic scouring action.

It is known that in rivers having shifting beds, the sand travels with a rolling movement along the bottom. The herein described system of oblique barrage permits of the utilization of this phenomenon and is designed to cause the sand to be automatically removed and deposited in an oblique direction so as not to impede the navigation.

The invention is illustrated in the accompanying drawings, wherein

Figure 1 represents the course of a stream the bed of which is supposed to be of a shifting nature and whose banks have been previously prepared, following suitable regular and progressive curves. In this case the channel which forms along the concave bends of the banks affords a sufficient draft of water for navigation, but at the points where the bank bends outwards into the stream, said banks are always formed so that at these points the depth of water is insufficient for navigation at low tide.

The present improvements render possible the formation across these sand banks, of a channel of suitable depth and with sufficient rapidity of flow to enable the navigation to be always maintained with the advantage of not causing any sensible alteration of the up or down channel or of the water level.

Referring to the portion of a river represented in Fig. 1, whose banks have been prepared in the manner described, it will be seen that from points 1 to 2 and from points 3 to 4 deep channels are formed and at 5 is a sand-bank through which it is sought to make a channel connecting the deep channels. By placing at A, B an oblique resisting screen, scouring action will be created. At the same time the passage for the water is restricted, and the velocity is increased the one being the natural consequence of the other. It is however necessary to dispose of the accumulation of sand consequent on the scouring action and to remove it to a point where it will not impede the stream. To this end we construct the dam in the form of sluices supported or suspended at a short distance above the bottom, whereby a strong current is set up beneath the dam and thus a rapid scour is produced carrying the sand behind the dam at 6. If the layer of water constituting this ground current is reduced in thickness to a sufficient extent in proportion to the total depth of the water the strength of the current will be dissipated very rapidly behind the dam and the sand will be deposited. It is therefore possible to cause the sand to be deposited at a greater or less distance, by increasing or diminishing the area of the passage left free for the current beneath the sluices. If it be desired to concentrate the water into one arm of the river, we also avail ourselves of the traveling movement of the sand over the bottom for the purpose of directing the water at the surface into the navigable arm and that near the bottom into the other arm.

In Fig. 2, C represents the arm to be rendered navigable. At 7, 8 is placed a vertical dam so disposed that its top shall be about $0^{m},50$ (say 20 inches) above the bottom of the stream and its direction slightly oblique to that of the current so as not to sensibly retard the bottom streams of liquid which latter will all be directed towards the larger arm D, the sand which they contain being incapable of passing the obstacle at 7, 8. The volume of water however passing to the small arm would be diminished to the advantage of the large arm, and in order to reestablish equilibrium there is placed at A. B. (Fig. 1) a dam provided with suspended sluices which conduct the surface water towards the small arm. This dam moreover causes a scour which is favorable to the flow of the sand.

A system of barrage with suspended sluices is illustrated in face view in Fig. 3 with some of the sluices removed from their suspension cross-bars. Fig. 4 is a vertical section on line E. F Fig. 3, and Fig. 5 a plan of the dam. Fig. 6 is an elevation on a different scale of a modified construction of the dam represented in Fig. 3, with some of the gates removed and Fig. 7 is a side view of the same drawn to a larger scale.

The same letters of reference denote like parts in all the figures.

Referring to Figs. 3, 4 and 5, the dam is constructed of piles *a* driven in a line which is dependent in each particular case on the bend of the banks and the object which it is desired to attain. These piles which are placed at regular distances apart are connected by two rows of horizontal ties *b* b^1 provided at equal distances apart with bearings *c* carrying holdfasts *d* in which are received the vertical guide rods *e*. Upon these guide rods *e* are fitted to slide the sluice gates *f* each constructed for example of three sheet iron plates connected together in any suitable manner, said plates being shod upon their vertical edges with angle irons riveted thereto, or they may be doubled on themselves for a small portion of their breadth. In order to operate these sluice gates and raise them to any desired height above the river bed any known means may be employed, for example a portable jack may conveniently be employed, the movable head of which would be placed under a shoulder formed on or riveted to the upper edge of the sluice gate.

In the modification represented in Figs. 6 and 7 the sluice gates are slidable in guides *e* carried on floating supports. The floating support is constructed of a sheet iron float *g* fixed on a horizontal frame *h* which carries a vertical truss beam *i* upon which are mounted the guide rods *e*. This arrangement permits of obtaining a constant rate of flow whatever may be the height of the water level due to the current from up-stream, since the outflow opening which divides the discharge will always be at least proportionate to this height of water. The vertical truss beam *i* is secured to the side of the frame *h* and maintained perpendicular thereto by means of tie rods and struts *q*. Each floating support is attached by two chains to two moorings placed in the bed of the river so as to occupy a position suited to the plan of the dam.

The method of mooring the dam represented in Fig. 7, permits of maintaining the floating support horizontal whatever may be the strain to which it may be subjected by the current. A chain *j* made fast at *k* carries a pulley *l* and passes around a fixed pulley at *m* and is thence wound upon a drum *n*. The mooring chain *o* which is attached to the moorings passes around pulley *l* and is wound upon a second drum n^1. By rotating drum *n* the ratio between the lengths of the two members of the chain may be varied and consequently their inclination, as well as the distribution of the strains, and it is possible in this manner to resolve all the forces acting upon the floating support into a single resultant which will counterbalance the pressure of the water upon the float. A footbridge *p* is provided to enable the attendants to adjust the sluices by means of jacks as described.

Claims.

1. Means for creating a navigable channel in a stream having a shifting bottom, comprising a deviating dam arranged at an angle with respect to the banks of the stream and provided with vertical movable gates suspended above the bottom and spaced apart therefrom, to impart to the upper portion of the stream of water a movement in a direction parallel with the dam and to permit the lower portion of the stream of water to follow its original direction, whereby to permit the eroded material to settle beyond the dam in the angle formed by the dam and the bank of the stream.

2. A device for creating a navigable channel in a river with a shifting bed, comprising a dam provided with a plurality of series of gates located with their bottoms above the bed of the river and adjustable toward and from said bed in the plane of the dam.

3. In a device for creating a navigable channel in a river with a shifting bottom, the combination of a vertical dam having suspended sluice-gates, and a bottom dam of small height for securing a scouring action of the material at the bottom of the river and causing the material to be removed and deposited in another place.

4. A device for creating a navigable channel in a river with a shifting bottom, comprising a vertical dam in the river, the dam comprising movable sluice-gates independently mounted with respect to each other, guides in which said gates are adapted to move, and piles to which the guides are secured, whereby the height of the dam can be adjusted with reference to the bottom of the river.

5. A device for creating a navigable channel in a river with shifting bottom, comprising a vertical dam in the river, in combination with floating-supports each comprising sluice gates, and each floating-support carrying a plurality of chains, and a pulley on one of said chains, the other chain being passed over said pulley and its end being anchored in a stationary position for providing adjustment.

6. An adjustable sluice-gate or baffle, comprising a float, uprights attached thereto, a plurality of plates mounted on said up-

rights, and flexible connections for adjusting said uprights to equalize the strains on the several parts of the device.

7. In a device for creating a navigable channel in a river with shifting bottom, the combination of an oblique dam with suspended sluice-gates and a bottom-dam of small height for securing a decanting action of the materials at the bottom of the river and causing the clear water of the upper portion of the stream to be concentrated into the navigable channel and the shifting materials of the bottom to be turned aside from said navigable channel.

8. A device for creating a navigable channel in a river with shifting bottom, comprising a vertical dam obliquely directed in the river, the said dam comprising movable sluice gates independently mounted with respect to each other, guides in which the said gates are adapted to move, and piles against which the guides are secured, whereby the height of the dam can be adjusted according to the level and bottom of the river.

9. A device for creating a navigable channel in a river with shifting bottom, comprising a vertical dam in the river, consisting of floating-supports, each comprising a float, uprights attached thereto, a plurality of sluice gates mounted on said uprights, flexible connections for adjusting said floats to equalize the strains on the several parts of the device, a plurality of chains and a pulley on one of said chains, the other chain being passed over the said pulley and its end being anchored in a stationary position for providing adjustment.

10. A process for creating a navigable channel in a stream having a shifting bottom, consisting in arranging a deviating dam provided with vertical movable gates at an angle with respect to the natural banks of the stream, and in suspending said gates above the bottom of the stream in such manner as to impart to the upper surface of the water a movement in a direction parallel with the dam and to permit the lower portion of the water to follow its original direction whereby to permit the eroded material to settle beyond the dam in the angle formed by the dam and the bank of the stream.

The foregoing specification of late LOUIS JOSEPH AUDOUIN'S means for causing an automatic scouring action for the removal of silt from river beds and waterways signed by me this eleventh day of March 1904.

EDOUARD MARIE AUDOUIN,
Administrator of the estate of Louis Joseph Audouin.

Witnesses:
MAURICE H. PIGNET,
HANSON C. COXE.