May 25, 1965 L. GALVAING 3,184,923

METHOD OF COLLECTING OIL OR OTHER RESIDUES ON THE WATERS OF PORTS AND ELEMENTS FOR CARRYING OUT SAME

Filed March 6, 1961 2 Sheets-Sheet 1

FIG 2

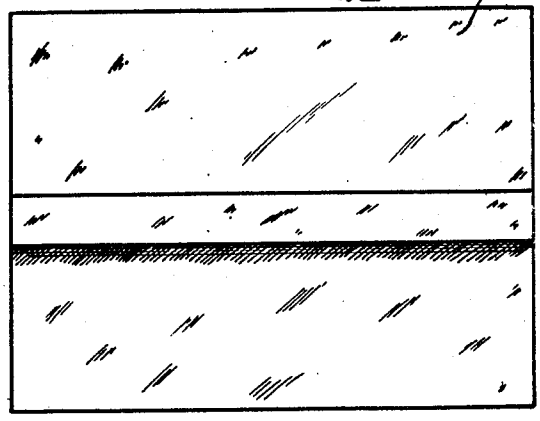
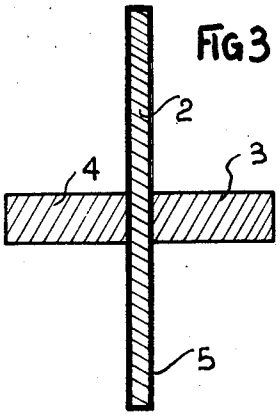


FIG 3



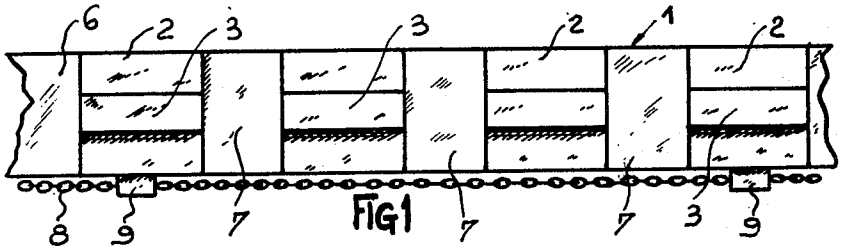


FIG 1

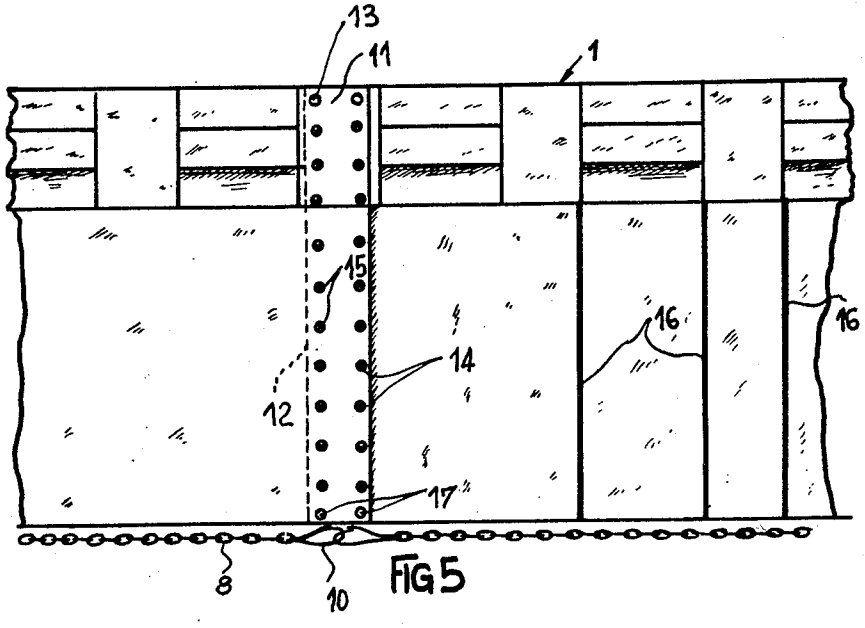


FIG 5

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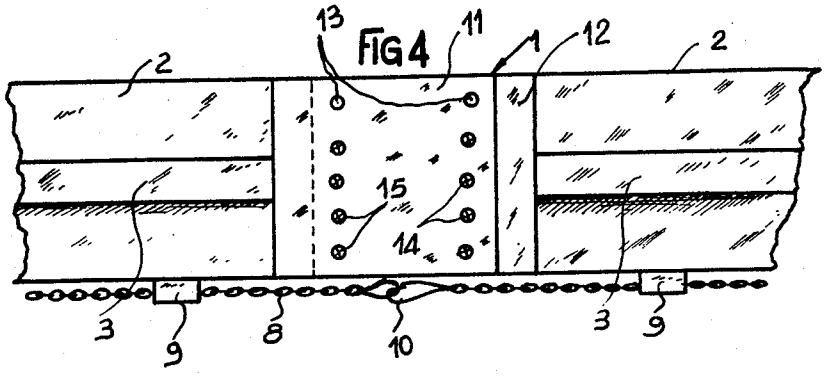

FIG 4

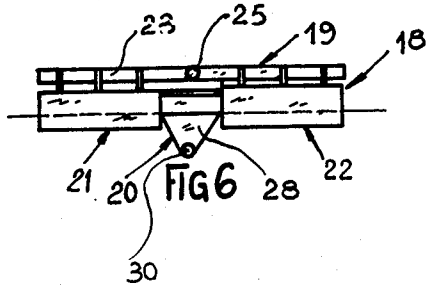

FIG 6

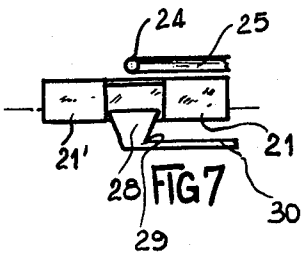

FIG 7

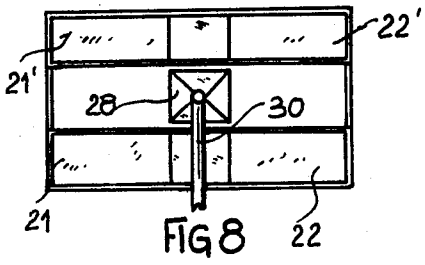

FIG 8

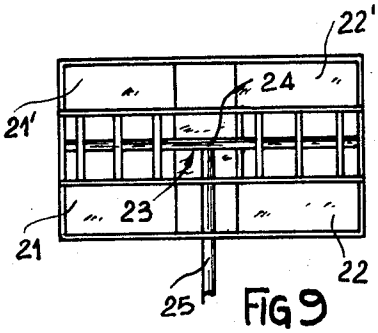

FIG 9

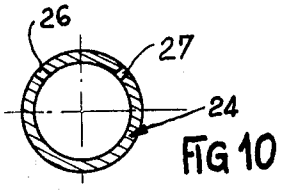

FIG 10

United States Patent Office 3,184,923 Patented May 25, 1965

3,184,923

METHOD OF COLLECTING OIL OR OTHER RESIDUES ON THE WATERS OF PORTS AND ELEMENTS FOR CARRYING OUT SAME

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Claims priority, application France, Mar. 7, 1960, 820,755
12 Claims. (Cl. 61—1)

The present invention relates essentially to methods of and means for catching and collecting oil residues and like refuses on the waters of seaports and the like.

It is known that the equipment now used in ports for this purpose consists in general of metal or wooden elements of a length varying from 16 to 20 feet. The lightest elements used to this end are made of balsa wood and weigh about 175 lbs., and owing to their shape and weight they must be towed to the site by a boat. This towing operation is difficult and slow due to the poor shape (from the point of view of navigation) of the barrage element. Furthermore, the water-tightness at the junction of the elements is generally most objectionable.

Moreover, it is difficult to subsequently complete the operation by reducing the area of the oil layer caught by the apparatus in order to increase the thickness of this layer and permit is collection.

In addition, due to the reflection of waves against the quays of docks and the like, the swell is always very short and although it is prevented from breaking by the overfloating oil layer the selected lengths are such that in frequent cases the barrage element cannot follow this swell and therefore sinks more or less and allows the oil to flow thereover.

It is the object of the present invention to avoid these various drawbacks and to provide therefore a method remarkable notably in that the aforesaid barrage is made of light-weight, flexible and movable elements interconnected in end to end relationship and consisting of a series of vertical plates provided with floats and hingedly interconnected through a flexible deformable sheath for example of fabric or the like which has a height at least equal to that of said plates and acts like a hinge between these plates.

According to another feature of this invention the aforesaid interconnecting sheath comprises an extension before the first plate and after the last plate of the assembly, these extensions being connected through laces, hooks, clips, snap-fasteners, turnbuckles, etc.

According to a further feature characterizing this invention the aforesaid extensions overlap partially so as to ensure a reliable water-tight joint between the elements.

Still according to a specific feature of this invention, the aforesaid sheath is provided along its lower and upper edges with reinforcing elements extending through its length and adapted to withstand the stress applied on the barrage by sea currents or for example during the towing thereof.

The aforesaid reinforcing elements consist of ropes, chains, metal wires, straps or the like, fastened on said edges.

In the case of a fabric or like strip the reinforcing elements consist preferably of multiple-fold hems.

The advantages resulting from this invention will be readily apparent to anybody conversant with the art.

The barrage element of this invention is constituted as follows:

The floats (preferably of very reduced length, for example 10 inches) consist for example of a plate or board of marine plywood to which are assembled two floats, one on each side, consisting in the standard construction of fireproof expanded plastics resistant to hydrocarbons.

A metal type, based on the same principle, has also been experimented for those cases where it is desired to encircle a quantity of burning oil. This alternative type is only slightly heavier but operates on the same lines. The plate is made of metal and the floats made of thin copper sheets are provided with an air vent pipe to avoid their explosion in case of fire.

Under these conditions, the weight may be reduced to one pound per float in the case of plastic-wood construction, and to 1⅓ lbs. in the case of all metal construction for fighting fires.

The barrage constructed according to the teachings of this invention is capable of retaining a four-inch thick oil layer on water while emerging about six inches above water, which is sufficient to prevent the oil from flowing over the barrage.

In order to ensure a longitudinal junction between the floats, the plates are slipt into a sheath of life-jacket fabric. They are held against movement therein by stitches, snap-fasteners or other suitable means, and the assembly is completed by securing the floats on their plates and attaching a light galvanized chain provided with snap-hooks at either end to the lower portion.

The function of this chain is not to act as ballast means, since the element is self-stabilized by its shape, but to avoid the application of undue stress to the fabric when the barrage is being raised.

If desired, a rope or any other adequate reinforcing device, for example a multiple-fold hem, may be substituted for the chain.

The barrage elements are also provided at their upper portion with another chain, cable or like reinforcing device.

These reinforcing devices receive the whole of the tractive effort resulting from the sea current or towing force and prevent the elements from heeling or capsizing both forwards and backwards.

Thus, the weight including the chain attains about 1.35 lbs./ft. as contrasted with 8 to 10 lbs./ft. in conventional devices of this character. In the metal construction the life-jacket fabric is lined with asbestos or glass-wool fabric, but the weight is then about 3.35 lbs./ft.

The dimensions of the elements are so selected that a length of 3 feet of element has the same prescribed buoyancy as a life jacket so that if, in case of accident or panic, a man falls into the water he may clutch hold of the barrage until he is rescued with a life-jacket or otherwise.

It will be noted that with this device:

(1) The barrage is extremely light and may be put afloat like a simple fishing net; in addition, it can easily be transported in its folded condition;

(2) It can be given any desired curvature in the horizontal plane;

(3) Due to the flexibility of the component elements of the device it is possible, after the oil catching manoeuvre, to reduce the area of the oil layer in order to increase the thickness of the oil layer and collect same without difficulty;

(4) The short floats rise without difficulty on the swell, notably that produced by the passage of a tug, since the fabric does not interfere with the movements of each separate element. Therefore, the barrage is flexible and articulated in both longitudinal and vertical directions;

(5) The interconnecting sheath is nearly free of any stress, since all the efforts resulting from the action of sea currents and towing operations are absorbed by the reinforcing elements provided along the upper and lower edges of said sheaths.

On the other hand, it is known that in conventional apparatus of this general type the weak side is at the junction between the elements. In the apparatus of this invention this risk is avoided due to the use of fabric sheathing.

It will be noted that when the fabric is soaked with water it becomes impervious to oils and like products.

The sheath of each element has at either end an extension of same length as that of the normal spacing between floats. At its upper portion it carries two lacing eyelets for fastening together two adjacent elements. At the lower portion the connection is effected through the chain-carried snap-hooks so as to resist with sufficient strength to the handling and like manoeuvres.

The water-tightness is obtained by using hooks or turnbuckles, but the preferred devices in this case are snap-fasteners, for example of the type used in drop-head cars. The combined action of the overlapping extensions and of these snap-fasteners ensure a complete water-tightness along the joints.

Any risk of loosening the snap-fasteners is precluded since all mechanical stresses are supported by the lacing and chain system.

This first type of barrage constitutes an emergency barrage but it can be converted at will into a decanting basin. It has been observed that when a mixture of oil or oil products and water is being pumped together with a large quantity of water the emulsion breaks up by itself and the oil products rise to the surface at a speed always greater than or equal to 100 feet per hour.

Therefore, if a mixture is pumped continuously from a bottomless vessel, an oily layer will separate and build up if the downward speed of the water is inferior to the upward speed of the oil. Thus, oil may be un-ballasted from a ship into a 1,300-ft. barrage at the rate of 141,250 cu. feet per hour. In this case the downward speed does not exceed 3⅓ feet per hour and permits the separation.

The barrage for solving this problem is the same as the one broadly described hereinabove, but instead of limiting the fabric or the plastic sheath to the lower edge of the plates, a hanging portion about three feet high is added thereunder and loaded with a ballast chain. Under these conditions, by assembling the elements end to end (this connection being effected exactly as in the preceding case except that lacing eyelets may also be provided at the lower end of the depending portion of the fabric sheath) and providing a chain at the bottom of the hanging fabric made preferably of heavier material, a vessel of any desired shape and surface area may be obtained.

These elements are also provided at their upper portion with ropes or the like acting as reinforcing elements. In addition, they comprise another rope mounted at the bottom of the plates in order to ensure a regular distribution of the tractive efforts and prevent the elements from heeling forwards or backwards.

This vessel may therefore be used for un-ballasting ships. Since it is not possible to deliver a jet of liquid directly into the closed barrage, it is diffused in sheet form by means of a T-shaped pipe of which the vertical branch is connected to the delivery pipe from the ship, the horizontal branch consisting of a tube in which inclined parallel slots parallel to a generatrix are formed said T-shaped pipe being mounted on a shaft anchored in said vessel.

The length of this horizontal branch varies with the output to be received. The raft must be anchored in order to prevent it from drifting and spinning due to the reaction of the ejected liquid.

The raft carries between its floats a funnel adjustable in height so that the edges of said funnel may be kept flush with the oil surface in order to reduce to a minimum the quantity of water collected with the oil.

After the area delimited by the barrage has been reduced in size for increasing the thickness of the oil layer the funnel is adjusted, its bottom being connected to the suction side of the collecting pump.

This invention is also concerned, with barrage elements utilized to carry out the method set forth hereinabove.

Other features and advantages of this invention will appear as the following description proceeds with reference to the accompanying drawings illustrating diagrammatically by way of example a few typical forms of embodiment of this invention.

In the drawings:

FIGURE 1 is a front elevational view of a barrage element constructed according to the invention;

FIGURES 2 and 3 illustrate in front view and sectional view respectively a typical float-plate of the barrage element of FIG. 1;

FIGURE 4 illustrates a connection between two adjacent elements;

FIGURE 5 shows a modified construction of a typical element;

FIGURE 5A is a perspective view of an element partly broken away in a fireguard barrage according to the invention;

FIGURE 6 shows a side view of a raft provided with the diffuser and collector apparatus;

FIGURE 7 is a front view of the raft shown in FIGURE 6;

FIGURE 8 is a plan view from above showing the raft of FIGURE 6, the diffuser being removed for the sake of clarity;

FIGURE 9 is a plan view from above showing the raft of FIGURE 6, with the diffuser mounted thereon, and

FIGURE 10 is a sectional view showing a diffuser pipe.

In the example described and illustrated herein, a barrage for catching and collecting residues, notably oil residues, on the waters of ports, consists of elements **1** each made of a series of flat plates or boards **2** disposed end to end and carrying on their two faces adequate floats **3**, **4**. These plates **2** and the floats **3**, **4** may consist of wood, metal or other suitable material. However, according to a preferred construction, these plates are made of marine plywood and the floats of expanded synthetic material. Thus, extremely light elements can be obtained. These plates are introduced into pockets **5** made of a sheath of fabric or any other suitable flexible material forming a hinge **7** between these plates. They are subsequently enclosed in their pocket sheath, or envelope **5** for example by stitching. The floats **3**, **4** are then mounted on the plates enclosed in their sheaths by means of known securing devices such as screws **6**.

Secured along the lower edge of the sheath **6** is a chain **8** mounted for example in gussets **9** carried by the sheath. This chain **8** is provided at least at one end with a snap hook **10** (FIGURE 4) for connecting the chain of one element to the chain of the next element. This chain **8** may also act if desired as a ballast or like inertia weight but its main function is to reduce the stress applied to the sheath **6** during the operation consisting in raising the elements.

A rope of any other adequate reinforcing means, for example a multiple-fold hem, may be substituted for the chain **8**.

The sheath also comprises at its upper portion another reinforcing element consisting for example of a hem **40**. These two reinforcing elements **8** and **40** are connected to the towing boats and their tension acting at the top and bottom of the device (the relative spacing of these reinforcing means being maintained by the plates **2**) prevents the plates from heeling and capsizing forwards or backwards.

Under these conditions, no stress is applied to the connecting sheaths, although the barrage itself is subjected to considerable stresses, even when towed at low speed.

FIGURE 4 illustrates the type of connection provided between adjacent elements.

The fabric or like sheaths interconnecting the plates **2** comprise extensions **11**, **12** externally of the first and last plates **2**. These extensions **11**, **12** of the elements are assembled with a view to constituting a kind of hinge between the two elements.

As illustrated in FIGURE 4, a substantial portion of

these two extensions of two adjacent elements overlap. They are formed at their upper portions (and if desired at their lower portions) with eyelets 13 through which adequate laces (not shown) may be passed. Thus, the elements are assembled in a flexible yet reliable manner since their upper portions are connected by lacing and their lower portions by the aforesaid chains 8. On the other hand, one or a plurality of rows of snap fasteners 14, 15 provide the necessary water-tightness between these adjacent elements. Of course, if desired, turnbuckles, clips or other known devices of this type may be substituted for the aforesaid snap fastener.

According to a modified embodiment illustrated in FIGURE 5, a fabric sheath 36 hangs from the lower end of plates 32 and in this case a chain 38 is relatively heavy in order to stiffen the fabric, but if desired the latter may be stiffened by means of vertical stiffener 46. Moreover, lacing eyelets 47 are provided for reinforcing the connection between adjacent elements in the lower portion of the extensions 41, 42 of the sheath 36.

In this case, the element comprises, in addition to the aforesaid chain 38, reinforcing means not only at its upper portion 39 but also at the level of the bottom 37 of the plates 32, these reinforcing means consisting of ropes or the like.

These elements are used mainly for forming decanting vessels permitting the unballasting of ships.

According to the alternate embodiment FIGURE 5A and when it is contemplated to use the barrage mainly for fighting fires, notably oil fires on water surfaces, comprise plates 52 made of metal and metallic hollow floats 53, 54 which are provided with air vent pipes 55. The plates 52 are slipped into pockets 56 formed in a fabric sheath (as described with reference to FIGURE 1 to 4) which is lined externally with another fabric 57 made of asbestos or glass fibers in order to render same fireproof. The floats are mounted on the sides of the plates by any known convenient means.

It has frequently been observed that when a fire attains its maximum intensity either the water or the burning materials boil and on the critical side, that is, leeward, this steam sheet constitutes a shield blocking one fraction of the heat flux radiated from the flames, which drops rapidly from 50,000 kcal./h./sq. meter to about 6,000 kcal./h./sq. meter, so that the temperature of the barrage does not exceed 400° C.

This shield is not formed immediately and the specific configuration of the floats 53, 54 is such that it retards somewhat the action exerted by the fire on the barrage at the beginning of the manoeuvre, before it is formed. To promote the formation of this shield, a free gap may be provided between the plate 52 and the floats 53, 54, to facilitate the cooling of said plate 52 and enable the vapors better to lick its surface. This plate 52 consists preferably of a high-conductivity metal such as copper or aluminum. Any known securing means may be used to mount the floats 53, 54 on either side of plate 52 provided that gaps are left between said floats and said plate. For example, it is possible to use angle plate means 58 connected to plate 52 and the upper and lower faces of floats 53 and 54 by means of screws bolts or the like.

To delay the action of fire on these plates and notably during the first minutes of a fire, they are slipped into a sleeve or sheath made of asbestos, vermiculite or other cellular inorganic material. These sleeves are coated with a layer of synthetic material adapted, during the first minutes of the fire, to be decomposed by the heat of the fire and to form a shield, the latter being subsequently replaced by the steam screen developed by the boiling water and materials. If desired, a wire gauze may be incorporated in the sheaths so that its heat conductivity will discharge the heat flux received by the assembly.

Of course, in the case of a fire-guard barrage the upper and lower ropes constituting the reinforcement of the standard barrage are replaced by chains which preferably serve only as a means for interconnecting the elements.

FIGURES 6, 7, 8 and 9 of the drawings illustrate a raft 18 equipped with a diffuser 19 and a collector 20 according to the teachings of this invention. This raft, adapted to be anchored inside the vessel formed by the barrage, consists of floats 21, 22 and 21', 22'. The diffuser mounted on these floats consists in this example of a T-shaped pipe 23 having its horizontal limb 24 parallel and close to the water surface. This horizontal limb 24 is closed at either end and the vertical limb 25 of the T-shaped pipe is connected to the delivery pump of the ship to be unballasted. The horizontal limb 24, as shown in FIGURE 10, has opposite slots 26, 27 formed therein which are parallel to the pipe axis. On the other hand, a funnel 28 adjustable in the vertical direction is mounted between the two floats and has its bottom 29 connected through a pipe 30 to the suction side of a collector pump.

The operation of the barrage described hereinabove is extremely simple. As the component elements of the barrage are particularly light, they can be transported without difficulty and thrown to the water like fishing nets. By properly towing the barrage thus formed the residues, notably oil residues, floating on the water surface are caught and then the end elements are approached to each other in order to reduce the area of the vessel formed by the barrage; this manoeuver can be accomplished very easily due to the great flexibility of the multiplate elements. Finally, by means of the collector 20 carried by the raft 18 anchored inside the barrage, the oil or other residues are pumped after having been concentrated to a sufficient degree.

The elements shown in FIGURE 5 are used in a slightly different manner. In fact, with these elements it is possible to constitute a decanting pond or vessel of a depth sufficient to permit the unballasting of ships. The ship to be unballasted is connected through a suitable pipe to the raft 18 and the latter, by means of the diffuser mounted thereon, pours the residues into the basin thus formed. Upon completion of the unballasting operation the pond or vessel is reduced in area and finally the thus concentrated residues are collected by means of the funnel 28 provided to this end on the raft 18.

Of course, the barrage of this invention can be anchored or fastened according to requirements, for example by providing anchoring means consisting of pig irons secured to the fabric sheaths or to the elements, or any other suitable and similar means.

Although the present invention has been described in conjunction with specific embodiments thereof, it will be readily understood by anybody conversant with the art that many modifications and variations may be resorted to without departing from the scope of the invention as set forth in the appended claims.

What I claim is:

1. A barrage element for catching and collecting residues from the surface of port waters, comprising a substantially vertical sheath having an upper edge and a lower edge extending parallel to the water surface, said upper edge being above the water surface and said lower edge being below the water surface, a plurality of substantially vertical pockets provided in spaced relationship in and along said sheath and each one connected to the adjacent one by a length of said sheath, a plurality of substantially vertical plates enclosed each one in one of said pockets and provided each one on each side thereof with one substantially horizontal float mounted externally of said sheath, both floats of each vertical plate being horizontally aligned.

2. A barrage element as claimed in claim 1, wherein said plates enclosed in said pockets have substantially the same vertical dimension as sheath.

3. A barrage element as claimed in claim 1, wherein reinforcing means are provided along the lower and upper edges of said sheath respectively.

4. A barrage element as claimed in claim 3, wherein said reinforcing means provided along the lower edge of said sheath consist of a chain provided at both ends with connecting snap-hooks.

5. A barrage element as claimed in claim 1, wherein said sheath comprises extensions fore and aft of the first and last plates respectively of said elements said extensions being provided with removable fastener means.

6. A barrage element as claimed in claim 1, wherein said pockets are formed in the upper portion of said sheath, and have lower edges substantially aligned parallel to the upper and lower edges of said sheath, reinforcing means being provided along the upper and lower edges of said sheath and along a line comprising said lower edges of said pockets and vertical stiffeners being provided in said sheath.

7. A barrage element as claimed in claim 1 wherein said plates are made of metal and said floats are hollow metal vessels provided each with an air vent pipe, said sheath being externally lined with a fireproof fabric.

8. A barrage element as claimed in claim 7, wherein said plates are slipt into a sleeve coated with a layer of synthetic material.

9. A barrage element as claimed in claim 8, wherein said sleeves are made of fireproof fabric including a wire gauze structure.

10. A barrage element as claimed in claim 7, wherein said hollow metal vessels are connected to said metal plate with securing means providing a gap therebetween.

11. A movable barrage for collecting residues from the surface of port waters, formed of elements comprising a substantially vertical sheath having an upper edge and a lower edge extending parallel to the water surface, said upper edge being above the water surface and said lower edge being below the water surface, a plurality of substantially vertical pockets provided in spaced relationship in and along said sheath and each one connected to the adjacent one by a length of said sheath, a plurality of substantially vertical plates enclosed each one in one of said pockets and provided each one on each side thereof with one substantially horizontal float mounted externally of said sheath, both floats of each vertical plate being horizontally aligned, sheath extensions fore and aft of each of said elements, the extensions of two adjacent elements overlapping partially, removable fastener means on said extensions of adjacent elements.

12. A movable barrage as claimed in claim 11 wherein said pockets are formed in the upper portion of said sheath and have lower edges substantially aligned parallel to the upper and lower edges of said sheath, reinforcing means being provided along the upper and lower edges of said sheath and along a line comprising said lower edges of said pockets and vertical stiffeners cooperating with said sheath.

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