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T. KLÜVER

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TOWING DEVICE WITH SAFETY DEVICE AGAINST CAPSIZING FOR TUGS

Filed April 12, 1926

2 Sheets-Sheet 1

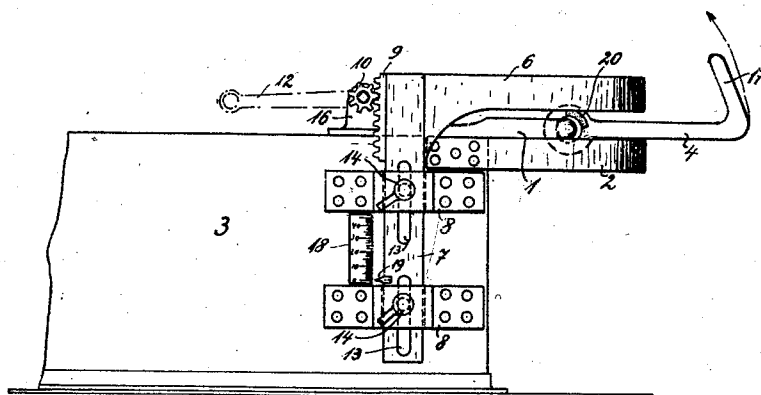


Fig. 1

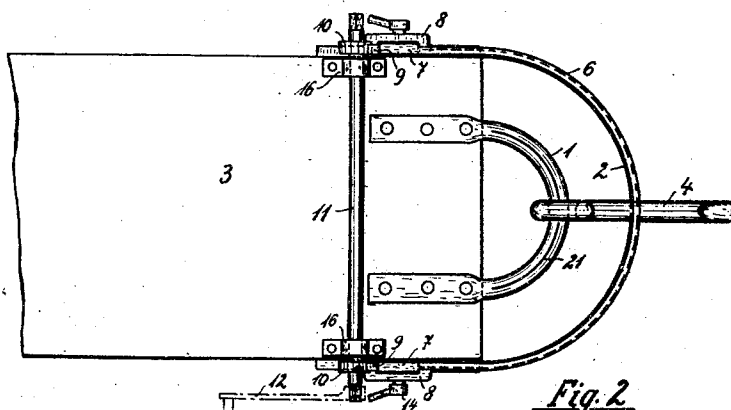


Fig. 2

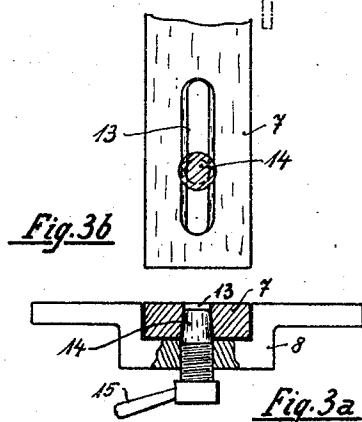


Fig. 3b

Fig. 3a

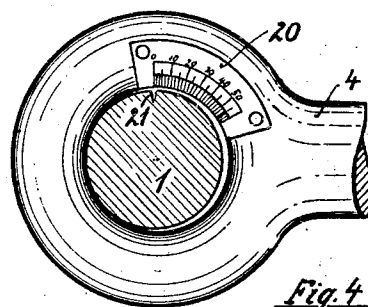


Fig. 4

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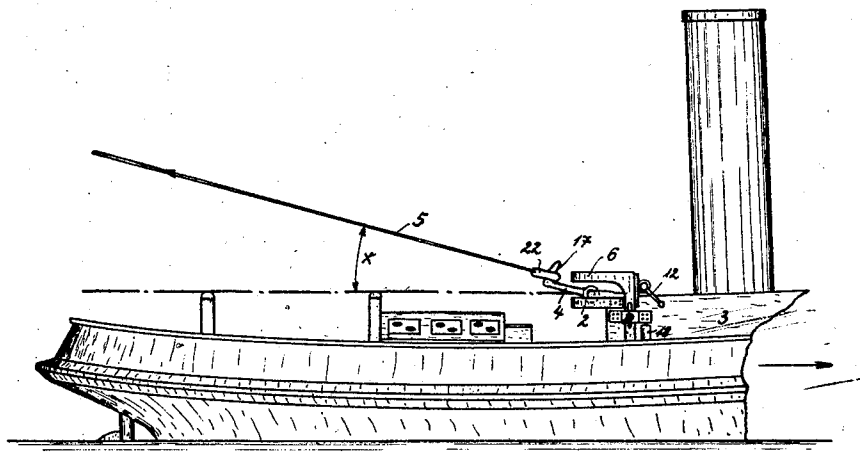


Fig. 5

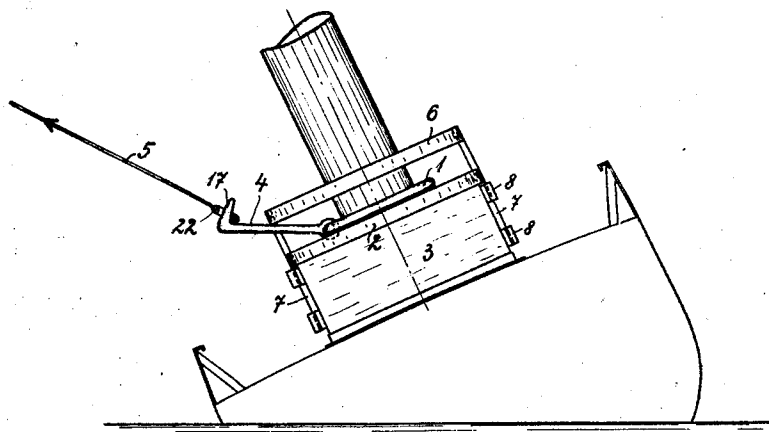


Fig. 6

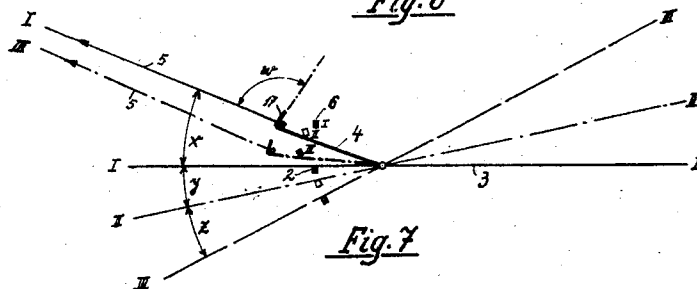


Fig. 7

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UNITED STATES PATENT OFFICE.

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TOWING DEVICE WITH SAFETY DEVICE AGAINST CAPSIZING FOR TUGS.

Application filed April 12, 1926, Serial No. 101,474, and in Germany February 17, 1926.

This invention relates to the towing device of known type arranged in well known manner upon tugs (steam-tugs, motor-tugs). The towing device consists mainly of the towing bow with guide bow and the towing hook. The invention relates more particularly to a safety device connected with this towing device and designed to effect in any case in time an unhooking of the towing-hawser as soon as the tug-boat assumes when towing an inclined position in longitudinal or transverse direction which, if it becomes excessive, might cause capsizing. The danger of capsizing is specially imminent if the tug-boat, when towing, stands transversely to the towing-hawser or if the tugged boat produces suddenly an additional pulling force for which the tug-boat is not prepared.

All these danger-moments are neutralized, according to the invention, by a safety bow, adapted to be adjusted in vertical direction, placed over the guide bow of the towing hook, so that, if the tug-boat assumes an inclined position, the towing hook bears against this safety bow and the towing-hawser is forced to slip off the towing hook if the inclination of the tug-boat becomes greater, the tugged boat being thus liberated from the tug-boat. As at this occasion the more or less inclined position of the towing-hawser, i. e. the towing-hawser-angle situated in the vertical plane which is dependent on the height of the boat in tow, and on the distance between this boat and the tug-boat, has to be taken into consideration, the safety device must be fitted with a device by means of which the actual greatness of the towing-hawser-angle can be ascertained in order to adjust according to this angle the distance between the guide bow and the safety bow.

An embodiment of the invention is shown, by way of example, in the accompanying drawing in which—

Fig. 1 shows in side elevation the towing-device and the safety device.

Fig. 2 is a plan view.

Figs. 3^a and 3^b show the means of fixation for the safety bow.

Fig. 4 illustrates the means for ascertaining the towing-hawser angle.

Fig. 5 shows in side elevation how the complete device is mounted on a tug-boat.

Fig. 6 illustrates how the safety device operates.

Fig. 7 is a diagram illustrating the operation of the safety device.

The towing-bow 1 and the guiding- or supporting-bow 2 are of known construction and mounted as usual on the rear end of the boiler-shaft 3 on the tug-boat. The towing-hook 4 mounted upon the towing-bow and slidably resting upon the guiding bow, said towing hook being either a simple open hook as shown in the drawing or a spring-hook, is adapted to oscillate in vertical direction on the towing-bow and move along the same in the horizontal plane from one side to the other. The towing-hawser 5 attached to the boat in tow is hooked over the towing hook 4 which adjusts itself automatically in the corresponding direction.

All these elements are well known. According to the invention a safety bow 6 adjustable in vertical direction is arranged over the guiding-bow 2 said safety bow being preferably of the same shape and size as the guiding bow so that, if the towing-hook moves from one side to the other and if the safety bow is stationary, the distance between the axis of the towing hook eye and the lower edge of the safety bow remains constant. Owing to this arrangement the towing hook can, in any position whatsoever, be oscillated in upward direction only by a certain angle around the axis of its eye.

The angle of vertical oscillation of the towing hook is therefore, for any position of the safety bow in vertical direction, of constant amplitude, the oscillating movement being limited below by the guide bow 2 and above by the safety bow 6. The angle of vertical oscillation of the towing hook is adjusted specially for each angle of towing as it depends on the angle of the towing-hawser as will be clearly understood from the description of the operation.

In order to vary the distance between the safety bow 6 and the guide bow 2 and in order to securely fix said safety bow in the adjusted position the safety bow has at each end two vertical strong supporting arms 7

slidable in two or more guide cheeks 8 arranged at either side on the boiler shaft 3. On each supporting arm 7 a rack 9 is fixed which gears with a pinion 10. The two
 5 pinions 10 are keyed on a common axle 11 which has a crank handle 12 by the rotation of which the safety bow can be raised or lowered. Each supporting arm 7 has two vertical slots 13 of conical cross section with
 10 which engage stop bolts 14 of conical cross section and screwed into a threaded bore in a guide cheek 8. The stop bolts 14 have each a handle 15.

The safety bow can therefore easily be
 15 fixed in any adjusted position.

The pinions 19 may also have stopping devices, for instance locking pawls on axle 11 or stop screws in the bearings 16.

The operation of the safety device and
 20 the meaning of the graduations shown on the towing hook 4 and on the one supporting arm 7 are as follows:—

If the tug-boat is in the normal horizontal position the hooked on towing-hawser 5 is
 25 either in horizontal position with regard to the boat in tow or more or less inclined. The shorter the distance and the greater the height of the boat in tow the greater will be the towing-hawser angle α (Fig. 7, position
 30 I). In this normal position the towing-hawser must never unhook and for this reason the straight nose 17 of the towing hook forms an acute angle with the shaft of the hook. On the other hand the towing hook
 35 must have sufficient play for oscillating in vertical direction and the safety bow 6 must consequently be adjusted so that its lower edge is at the normal towing state at a certain distance above the towing hook (Figs.
 40 5 and 7). Only if the tug-boat has a certain inclination, for instance 25° , at which the danger of capsizing exists, the towing-hawser must unhook. The tug-boat must therefore incline at an angle γ before the safety
 45 bow 6 comes in contact with the towing hook 4 but even in this case no unhooking takes place as the towing-hawser 5 and the nose 17 of the hook stand at an obtuse angle w the one with regard to the other (Fig. 7 position II). When the tug-boat inclines
 50 more, for instance at the angle z , the safety bow 6 presses the towing hook down so that towing-hawser and shaft of the towing hook do no longer form a straight line and the
 55 towing-hawser is made to slip out of the towing hook by the action of the pulling force (Fig. 7, position III and Fig. 6).

The sum of the two angles γ and z is always constant as it corresponds to the maximum admissible angle of inclination of the
 60 tug-boat at which the unhooking of the towing-hawser must take place. This angle of inclination alone would therefore require only a permanently equal distance between
 65 the safety bow 6 and the guiding bow 2, if

the variable angle α of the towing-hawser had not to be taken into consideration. For every degree of which the angle of the towing-hawser increases the said distance must
 70 be increased also. The increasing of distance which becomes necessary from degree to degree is marked on the graduation 18 and it is indicated by a hand 19 connected
 75 with the supporting arm 7. The figures on this graduation correspond further to the figures of the degrees of the angle of the towing-hawser. In order to be able to ascertain the same directly an angle-meter 20
 80 is mounted on the eye of the towing hook so that it oscillates with the same, a small longitudinal groove 21 being cut into the upper surface of the towing bow 1. Owing to this groove every angular position of the towing hook, i. e. the angle of the towing
 85 hawser can be read at any time on the angle meter if the hawser is stretched, as can be easily seen from Fig. 4. The angle must evidently be read if the tug-boat is in the normal position, and care has to be taken
 90 that the towing hook does not bear onto the safety bow.

The operation of the safety device is briefly as follows:—

The towing hawser 5 attached to the boat to be towed is hooked by means of its
 95 eye 22 onto the towing hook and stretched by the tug-boat so that the angle of the towing-hawser can be read on the angle-meter 20. The safety bow 6 is then adjusted by means of the crank handle to such
 100 a position that the hand 19 indicates on the graduation 18 the same number of degrees as indicated by the angle-meter 20. In this position the necessary distance between safety bow 6 and guide bow 2 exists which takes
 105 into consideration the existing angle of the towing-hawser and corresponds to the maximum angle of inclination of the tug-boat which is admissible. When the inclination of the tug-boat in the direction of the tow-
 110 ing-hawser becomes equal to this angle the towing-hawser will unhook automatically owing to its position with regard to the nose 17 of the hook at an acute angle, the towing-hawser being along the board or perpendicular to the board of the tug-boat.
 115 Capsizing of the tug-boat by the pulling towing-hawser is therefore avoided in any case. It has however to be remarked that the towing-hooks to be used in connection with the safety device must always have a nose 17
 120 which extends on the inside in a straight line and as smoothly as possible in order that unhooking at the maximum admissible angle of inclination of the tug-boat is ensured.
 125

As regards the construction of the several elements, for example as regards the profile of the cross section of the bow and of the supporting arms and as regards special stiff-
 130

ening- or supporting-stays of the safety bow modifications are possible, and therefore it is not the intention to limit the invention to the form of construction shown. The safety device may be provided also on towing devices which are not mounted in the boiler shaft but on separate towing frames.

I claim:—

1. A towing device on tug-boats with safety device against capsizing, comprising in combination with a towing bow, a towing hawser, a guiding bow, a towing hook having a nose which extends in a straight line, a safety bow adjustably arranged above said guide bow and curved in accordance with the horizontal path of movement of said towing hook and designed to press upon said towing hook if the tug-boat stands at a predetermined angle of inclination and which presses said towing hook down as soon as this angle of inclination is exceeded in the direction of said stretched towing hawser said nose of said towing hook assuming with regard to said towing hawser a position at such an acute angle that said towing hawser is automatically unhooked from said hook by the action of its pulling force.

2. A towing device on tug-boats with safety device against capsizing, comprising in combination with a towing bow, a towing hawser, a guiding bow, a towing hook having a nose which extends in a straight line, a safety bow adjustably arranged above said guide bow and curved in accordance with the horizontal path of movement of said towing hook and designed to press upon said towing hook if the tug-boat stands at a predetermined angle of inclination and which presses said towing hook down as soon as this angle of inclination is exceeded in the direction of said stretched towing hawser said nose of said towing hook assuming with regard to said towing hawser a position at such an acute angle that said towing hawser is automatically unhooked from said hook by the action of its pulling force, a vertical holding arm at each end of said safety bow, guide cheeks on the tug-boat for guiding said holding arms, a rack at the upper end of each holding arm, a transverse axle, a crank handle for rotating said axle, and two pinions keyed on said axle and gearing with said racks for raising and lowering said safety bow in order to adjust the same with regard to said guide bow in vertical position.

3. A towing device on tug-boats with safety device against capsizing, comprising in combination with a towing bow, a towing hawser, a guiding bow, a towing hook having a nose which extends in a straight line, a safety bow adjustably arranged above said guide bow and curved in accordance with the horizontal path of movement of said towing hook and designed to press upon

said towing hook if the tug-boat stands at a predetermined angle of inclination and which presses said towing hook down as soon as this angle of inclination is exceeded in the direction of said stretched towing hawser said nose of said towing hook assuming with regard to said towing hawser a position at such an acute angle that said towing hawser is automatically unhooked from said hook by the action of its pulling force, a vertical holding arm at each end of said safety bow, said holding arms having each longitudinal slots of conical cross section, guide cheeks on the tug-boat for guiding said holding arms, a rack at the upper end of each holding arm, a transverse axle, a crank handle for rotating said axle, and two pinions keyed on said axle and gearing with said racks for raising and lowering said safety bow in order to adjust the same with regard to said guide bow in vertical position, and fixing screws having conical ends screwed into said guide cheeks to engage with and to be wedged into said longitudinal slots of said holding arms for securely fixing said holding arms and through the same said safety bow in the adjusted position.

4. A towing device on tug-boats with safety device against capsizing, comprising in combination with a towing bow having a longitudinal groove, a towing hawser, a guiding bow, a towing hook having a nose which extends in a straight line, a safety bow adjustably arranged above said guide bow and curved in accordance with the horizontal path of movement of said towing hook and designed to press upon said towing hook if the tug-boat stands at a predetermined angle of inclination and which presses said towing hook down as soon as this angle of inclination is exceeded in the direction of said stretched towing hawser said nose of said towing hook assuming with regard to said towing hawser a position at such an acute angle that said towing hawser is automatically unhooked from said hook by the action of its pulling force, a vertical holding arm at each end of said safety bow, said holding arms having each longitudinal slots of conical cross section, guide cheeks on the tug-boat for guiding said holding arms, a rack at the upper end of each holding arm, a transverse axle, a crank handle for rotating said axle, and two pinions keyed on said axle and gearing with said racks for raising and lowering said safety bow in order to adjust the same with regard to said guide bow in vertical position, fixing screws having conical ends screwed into said guide cheeks to engage with and to be wedged into said longitudinal slots of said holding arms for securely fixing said holding arms and through the same said safety bow in the adjusted position, an

angle-meter on the eye of said towing hook cooperating with said longitudinal groove in said towing bow, a graduation at the side of one of said holding arms, and a hand on
5 said holding arm for indicating on said graduation the actual distance between said safety bow and said guide bow with regard to the degrees of the angle of the towing hawser said degrees being indicated by said angle-meter and said longitudinal groove 10 of said towing bow.

In testimony whereof I affix my signature.

THEODOR KLÜVER.