Feb. 20, 1962 N. FEIS 3,021,811

SMOKESTACK, MORE ESPECIALLY A SHIP'S FUNNEL

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FIG.1

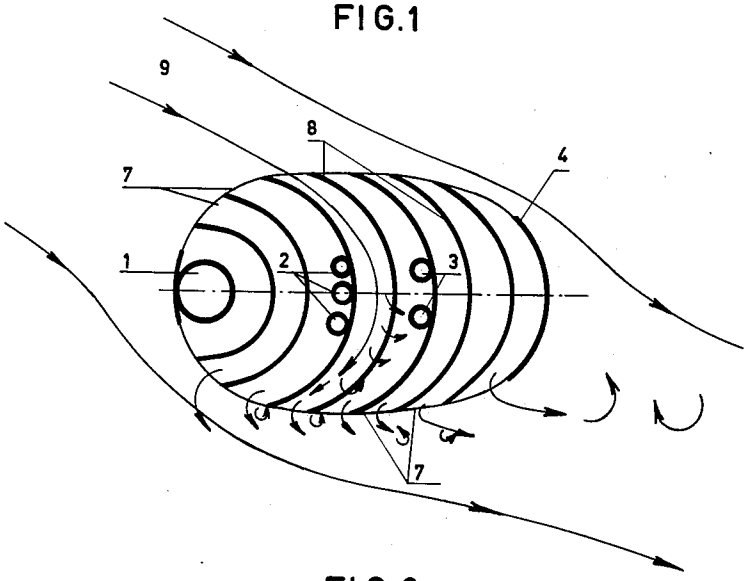
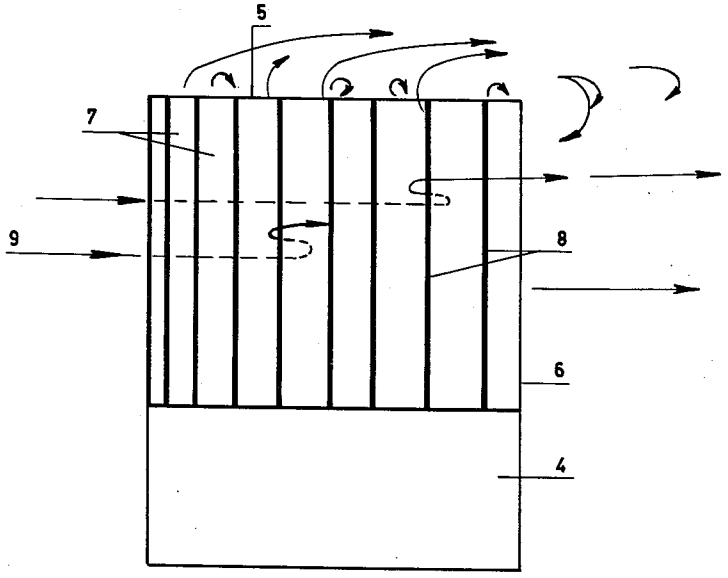


FIG.2



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FIG.3

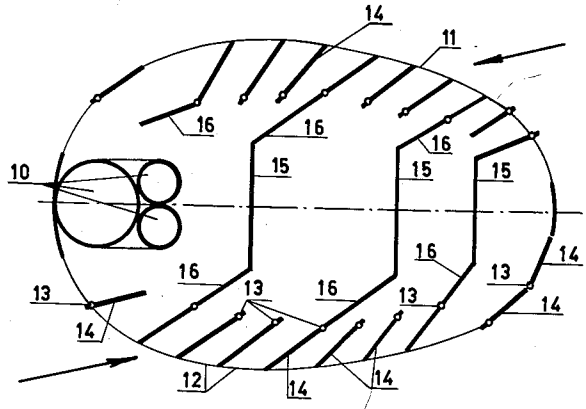
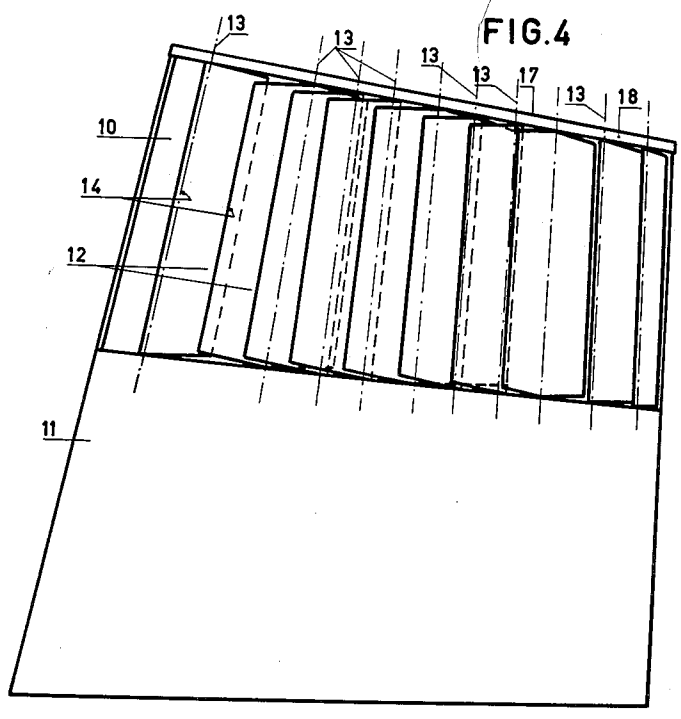


FIG.4



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SMOKESTACK, MORE ESPECIALLY A SHIP'S FUNNEL

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6 Claims. (Cl. 114—187)

The invention relates to a smokestack, more especially a ship's funnel, provided with at least one inner stack, surrounded by an outer stack of substantially streamline contour.

By such funnels a more or less strong smoke nuisance is caused on board on the decks when the relative wind directions either before or abaft the beam are at angles of 20 to 70° to the longitudinal axis of the vessel. The squatter the shape of the funnel and the smaller the ratio between the velocity of smoke discharge and the relative wind velocity the more this nuisance will grow. Even the shaping of the superstructure of the ship can contribute to this, if its parts are strongly contrasted, showing, for example, low forward and quarter decks with a high central superstructure, as in cargo vessels with limited passenger accommodation.

To the leeward side of the funnel and also from the upper edges of the windward side of the funnel and of the superstructure strong whirls are formed, which together form a wake or vortex area over the ship and particularly abaft the funnel, into which the discharge gases are drawn and subsequently sucked down. The lower the discharge velocity, the less the ejection force with which the gases are propelled over the vortex area and the greater the nuisance which may be brought about. As a matter of course the elevation of the discharge openings above the ship is very important, but modern ships, partly for other reasons, already possess low funnels, so that it is only with low relative wind velocities that no nuisance occurs.

According to the present invention the wake to the leeside of the funnel is to a large extent taken away, so that the relative wind velocity on the leeside of the funnel is not lowered and the underpressure there prevalent does not suck down the discharge gases over the edge of the inner stack.

To this end the directing means according to the present invention consist of bent or angular fins, which substantially connect openings on the port side with openings on the starboard side.

In this way an air stream which is received is not deflected about the outer stack, with the disadvantage of an upward propulsion from overpressure being brought about on the windward side and a downward suction from underpressure on the leeward side, but it passes through the slit-like openings and is completely led by the fins or guiding plates and is carried to the leeward side substantially without causing any whirls.

By an appropriate shape and disposition of the fins, part of which are, according to this invention, rotatable about shafts or axles substantially parallel to the centre line of the funnel, so that this part is adjustable according to the prevailing wind direction, instead of an underpressure a slight overpressure may even on occasion be obtained, so that a plume of smoke when discharged is driven upward instead of being sucked down. Because part of the fins are adjustable this carrying away of the discharge gases over a longer distance can be realized with any angle of incidence of the relative wind direction. Hereby it may be commendable to keep the slit-like openings and the rear part of the outer stack at the farthest

possible distance from the top-opening of the inner stack and therefore to position this inner stack as far to the front of the outer stack as possible and to give the upper edges of said outer stack a more or less downward inclination to the rear and, if desired, to have it covered by a top plate, in which the opening of the inner stack is provided.

Hereby it is achieved, that with wind directions forward the beam causing the highest relative wind velocity, the slight whirls which are still being deflected from the fins and/or the rear part of the outer stack, have a minimum possibility of effecting the combustion gases as they are discharged.

In order to achieve a minimum resistance against the air stream inside the outer stack, it may, according to this invention, be commendable that some fin parts are made so as to be adjustable to parts of several other adjoining fins. Generally, therefore, more fin parts will be present in the periphery of the outer stack than in its interior adjoining the inner stack.

The accompanying drawings show, for purposes of explaining the present invention, some embodiments of funnels according to this invention.

FIG. 1 shows a horizontal sectional view of an elliptical funnel with fixed fins in which part of the course of the whirls is schematically shown.

FIG. 2 a view of the funnel with part of the course of the whirls schematically shown.

FIG. 3 shows a horizontal sectional view of a funnel of streamline contour with fixed and adjustable fin parts.

FIG. 4 a view of the funnel according to FIGURE 3.

In FIGURES 1 and 2 the funnel consists of one gas discharge channel 1 of an auxiliary boiler, three exhaust pipes 2 of the auxiliary motors and two exhaust pipes 3 of the principal motors, all of which pipes are encompassed by an elliptical outer stack 4, which reaches up to the upper edges 5 of the pipes. The upper part 6 of the outer stack 4 is provided with vertical slit-like openings 7, which are formed by the outer edges of the bent fins 8 which connect the starboard side of the outer stack to its port side and which form continuous channels, by which the air stream 9 is received, and is divided and carried along without any special overpressure making itself felt on the windward side of the funnel, whilst the underpressure normally prevailing on the leeward side of the outer stack also is balanced.

Hereby no extensive wake is formed abaft the funnel, but only a slight local whirl near the edge of the opening.

The end whirl, which is normally formed at the upper edge of the funnel, is here divided into a number of small whirls, which roll along to the leeward side. These whirls, however, do not, as in other cases, sag downward into the wake of the funnel, but are carried along by the air stream which is passed through the fins and which has substantially no underpressure, and only come down at a far longer distance from the funnel, if they do come down at all.

In using fixed fins it is yet possible for some disturbance to be brought about by vertical whirls, but by applying the construction according to FIGURES 3 and 4 the air stream abaft the funnel is still considerably improved.

In FIGURES 3 and 4 a modern type of funnel is shown having a streamline longitudinal section and an inclined upper surface.

The smoke discharge channels 10 are hereby combined and disposed as much as possible to the front in the outer stack, which is formed by a plating 11, which at the upper side again is provided with openings 12. These openings are formed between fin parts 14 which can rotate about substantially vertical shafts 13, and which can

be adjusted according to the prevailing relative wind direction. Besides the movable fin parts some fixed fin parts **15** have been disposed in the middle, whilst fin parts **16**, being disposed more towards the inner side, and being rotatable about various shafts **13**, can be adjusted to various fixed or movable fin parts, in order to obtain an optimal air circulation. In this way the wake of the funnel can be filled up no matter if the wind is forward or abaft the beam. By disposing only a few fin parts in the interior the resistance to the air flow through the smoke stack is lessened, whilst by the many fin parts near the periphery of the outer stack the most even division possible is obtained. The openings of the smoke discharge channels **10** lie in an inclined plane **17** and it can be advantageous to provide the upper rotation points of the shafts or axles **13**, which have in any case to be interconnected with a view to stability, in a covering plate **18**, whereby only at a fair distance to the rear of and below the point of discharge of the exhaust gases an end whirl springs up at the edge of this plate **18**, which is carried off far away by the air stream passing between the fins.

As a matter of course such a plate can also be present in FIGURE 1, or, if the stability of the movable fins **14** is high enough, this plate **18** can be left out in FIGURE 4.

I claim:

1. A smokestack comprising an outermost stack having a substantially streamlined outer periphery, at least one other stack extending within the outermost stack, and a series of fins extending substantially parallel to the longitudinal axis of and above the top of said outermost stack adjacent said outer periphery thereof, the fins being disposed in spaced relationship along at least a part of both sides of the outermost stack to form slit-like openings between fins, and at least a portion of the fins on one of said sides of the outermost stack connecting with corresponding fins on the other side thereof to form a series of arcuate channels extending transverse said outermost stack between said sides thereof.

2. A smokestack comprising an outermost stack having a substantially streamlined outer periphery, at least one other stack extending within the outermost stack, and a series of fins extending substantially parallel to the longitudinal axis of and above the top of said outermost stack adjacent said outer periphery thereof, the fins being disposed in spaced relationship along at least a part of both sides of the outermost stack to form slit-like openings between fins, at least a portion of the fins on one of said sides of the outermost stack connecting with fins on the other side thereof to form transversely extending channels between openings on the sides, and at least a portion of said series of fins being mounted to rotate about axes substantially parallel to said longitudinal axis of the outermost stack.

3. A smokestack comprising an outer stack having a substantially streamlined outer periphery, at least one other stack extending within the outer stack, and a series of fins disposed above the top of the outer stack substantially parallel to the longitudinal axis thereof, at least a portion of said fins traversing the central longitudinal plane of the outer stack in spaced relation to one another and terminating at points adjacent the sides of the outer stack to define elongate channels extending transverse said outer stack.

4. A smokestack according to claim 3 wherein the series of fins also includes fins disposed in the channels adjacent said sides of the outer stack.

5. A smokestack according to claim 3 wherein said portion of the fins define a series of arcuate channels extending transverse said outer stack.

6. A smokestack according to claim 3 wherein at least a part of the series of fins are mounted to rotate about axes substantially parallel to the longitudinal axis of the outer stack.

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