

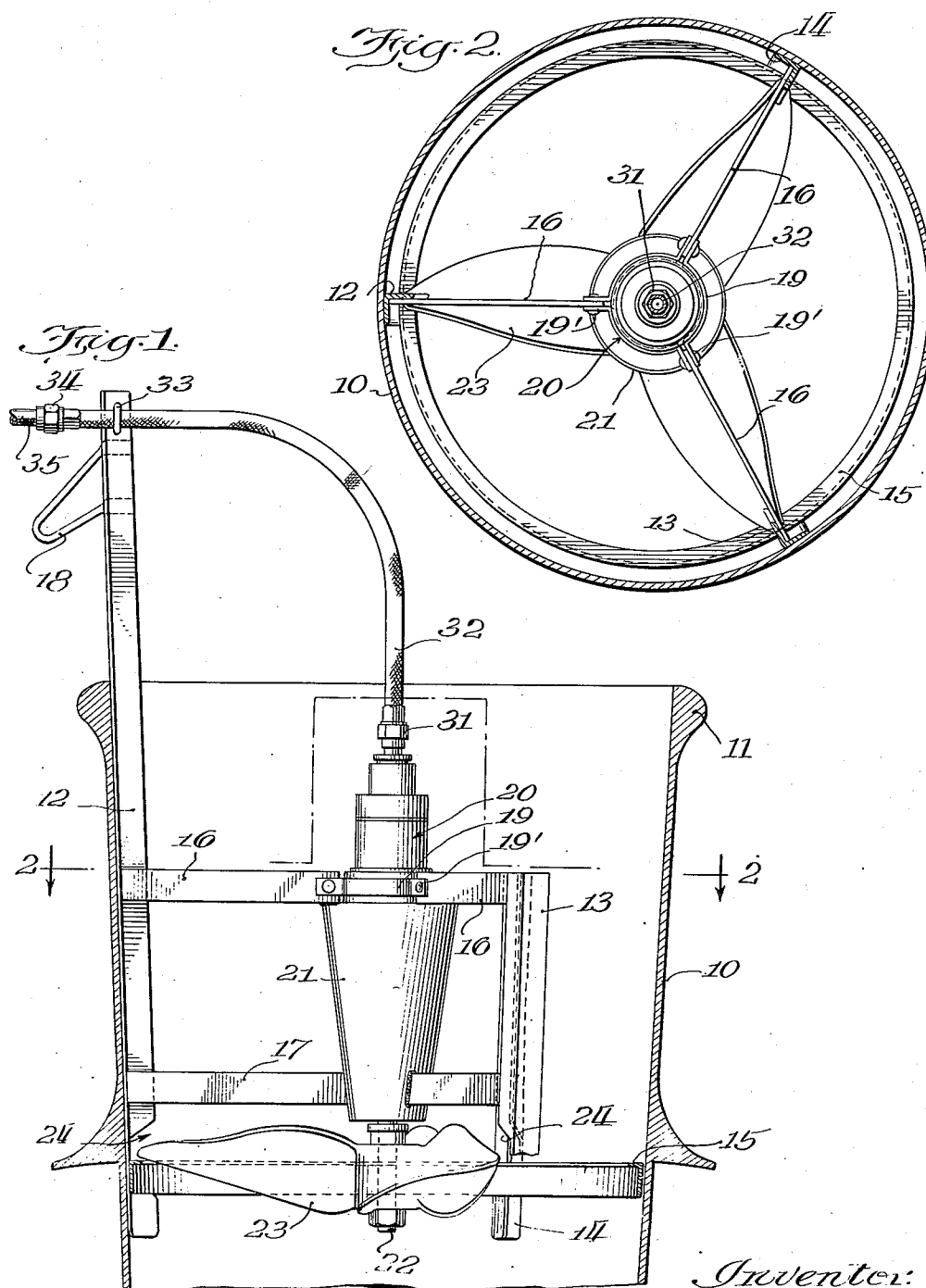
Dec. 17, 1940.

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LOCOMOTIVE DRAFT INDUCER

2,225,412

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2 Sheets-Sheet 1



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Fig. 4.

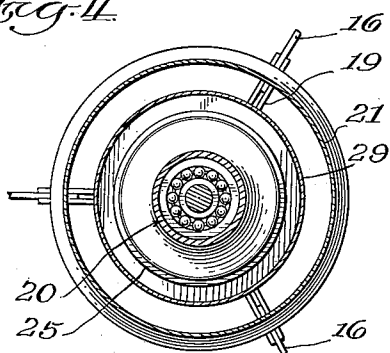


Fig. 3.

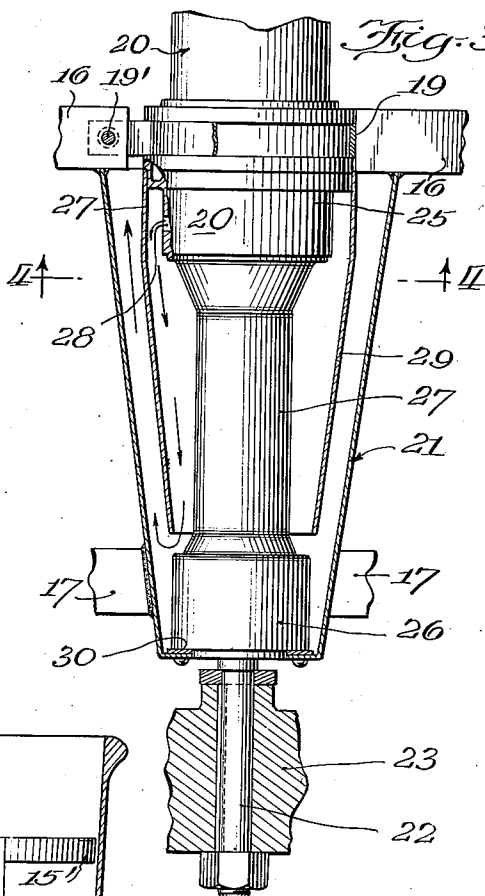
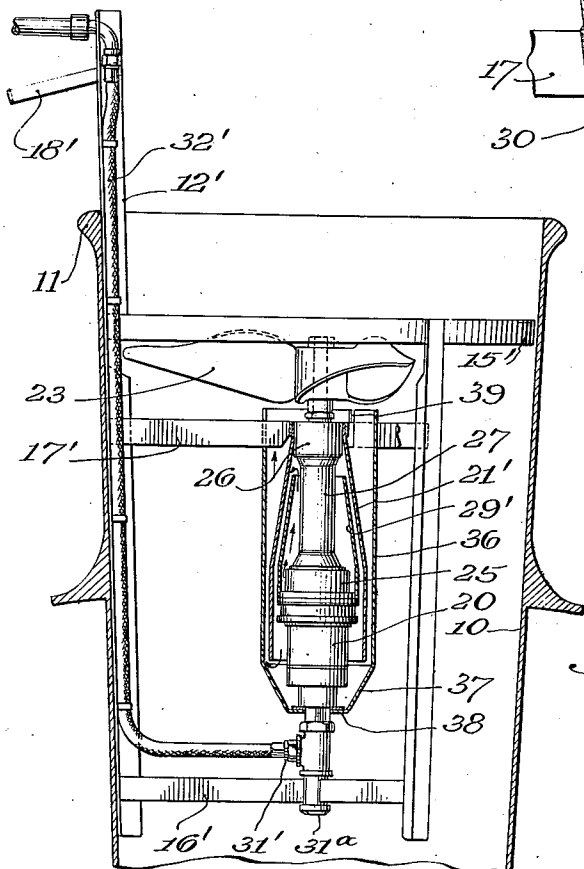


Fig. 5.

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LOCOMOTIVE DRAFT INDUCER

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17 Claims. (Cl. 110—159)

My invention relates to locomotive draft inducers and particularly draft inducers temporarily applied to the stacks of locomotives generally at round houses for initially building up the fires and raising the steam pressure to proper condition for runs.

Among the objects of my invention are:

A portable draft inducer of such light weight and small size that it may readily be carried about by hand and manually applied to the stack without the necessity of positioning or securing mechanism;

A draft inducer which is not confined to fixed locations and, therefore, can be applied to a locomotive in any position within the round house or in the terminal yard where a fan propelling medium is available;

The substitution of a compressed air driven fan for the usual draft aspirating steam jet in the terminal firing of locomotives, thereby eliminating the installation expense, waste due to condensation and leakage and danger of scalding the attendant to steam lines run throughout the round house;

Better dissipation of smoke by the absence of condensing moisture, usually supplied by steam injection, acting as the nuclei for accumulating soot particles;

The use of the locomotive stack itself for the three-fold functions, (a) of a guard for the fan while in use, (b) a casing for confining the products of combustion to passage across the effective area of the fan, and (c) a support for the draft inducing device as a whole;

A draft inducer readily applied to various locomotives regardless of wide variations within commercial limits of the height of the stack above the track or the height of the stack relative to the boiler shell;

The use of the fluid driving medium exhausted from the fan motor for cooling the motor and fan bearings to protect them against the heat of the products of combustion being blown by the fan; and

A locomotive draft inducer of greater economy in original cost and in application and operation.

The foregoing, together with further objects, features and advantages are set forth in the following description of specific embodiments of my invention illustrated in the accompanying drawings, wherein

Fig. 1 is a vertical section through the upper part of a locomotive stack showing my draft in-

ducer positioned therein with the fan guard ring broken into similar section;

Fig. 2 is a plan section taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary vertical elevation similar to Fig. 1, but on a larger scale and showing the shrouds for the air motor in section;

Fig. 4 is a horizontal section looking upwardly and taken on the line 4—4 of Fig. 3; and

Fig. 5 is a view similar to Fig. 1 but showing an alternative arrangement.

In Fig. 1 I have shown an upper part of a conventional locomotive stack 10 generally cylindrical but slightly tapered inwardly from its top edge and reinforced at its upper periphery by integral ring 11. My draft inducer is shown as having been inserted into the open end of the stack. The draft inducer is framed by a set of three upright frame members 12, 13 and 14, a guard ring 15 spacedly interconnecting the uprights near their lower ends, a set of three upper radially disposed struts 16 and a lower set of three radially disposed struts 17. The uprights 12, 13 and 14 are of angle stock spaced about a circle and in tapering relationship so that they lie substantially parallel with and against the inside of the tapered stack 10. The upright 12 is considerably longer than its mates so that it extends above the top of the stack and carries a handle 18. In applying the device to the stack, the device is inserted in the stack and permitted to descend until the outer edges of the three uprights 12, 13 and 14 simultaneously engage the inside of the stack. The depth to which the frame will descend before being lodged in the stack will thus be subject in practice to variations due to slight variations in the diameters and tapers of various stacks. In those instances of stacks having internal diameters considerably greater than standard, or of considerably lesser taper than standard, the handle 18 will also serve as a stop to limit the depth to which the frame may be inserted.

The outer end of each upper strut 16 is spot welded to one of the uprights 12, 13 and 14 respectively. The inner end of each is secured by bolts 19' between the offset ends of arcuate iron straps 19 which embrace the air motor 20 near its upper end. The outer end of each of the lower struts 17 is similarly secured to the uprights at a lower point. Their inner ends are spot welded to a frusto conical shroud 21 which extends downwardly from the struts 16 and at its lower end is secured to the lower end of the air motor 20. The shaft 22 of the air motor,

which protrudes downwardly therefrom, carries a three blade propeller type fan 23. The fan 23 and its air motor 20 are thus supported by the frame centrally thereof so that when the frame is inserted in the stack, the axis of the motor and fan is substantially coincident with the axis of the stack.

The guard ring 15 is positioned in the plane of the fan 23 where it is best adapted to protect the tips of the fan blades. The vertical flange of the ring 15 is spot welded to the tangential flanges of the several uprights 12, 13 and 14, the radial flanges of these angle shaped uprights being cut away as indicated at 24 for this purpose, as well as to provide clearance for the tips of the fan blades.

The air motor 20 itself may conveniently be of the type and size manufactured by Ingersoll-Rand Company of New York City, and designated as their "Multi-Vane" Pneumatic Motor, size 2E5, and this is the air motor indicated somewhat diagrammatically in the drawings. The rotor and its main bearings are housed within the portion 25 of the casing, while the protruding shaft or arbor 22 is supplementarily journaled in the distant end portion 26 of the housing. The shell of the portion 25 of the casing provides an exhaust chamber 27 for the air passing from the multi-vane rotor. An inner shroud 29 embraces the portion 25 of the casing. The upper end of the shroud 29 replaces the usual slitted exhaust cap or shroud with which the commercial air motor is originally provided. The inner shroud 29 extends downwardly from the casing portion 25 and tapers inwardly in frusto conical form to a point closely adjacent the enlarged casing portion 26. The tapered portion of the inner shroud 29 is substantially parallel with but spaced inwardly from the outer shroud 21. The inner shroud 29 thus acts as a baffle confining the exhaust air discharged from the motor through ports 28 to downward travel around and in contact with the intermediate portion 27 of reduced diameter of the motor casing and into contact with the lower casing portion 26. From here the exhausted air is confined to upward passage in the space between the shrouds 21 and 29, discharging to atmosphere at the upper end of the two shrouds. In this manner the relatively cool air exhausting from the air motor is confined to passage along both bearing housing portions of the casing whereby the bearings are cooled and the spaces defined by the two shrouds further act as insulators against the absorption by the casing of heat from the hot combustion gases passing upwardly through the stack.

Heat resistant composition washers 30 may advantageously be employed between the end shoulder of the bearing portion 26 and the inverted bottom flange of the outer shroud 21 to insulate the attachment against heat conductivity to the casing.

The air exhausted from the air motor and thus put to service in cooling the air motor and the fan bearings is not discharged into the combustion gases passing through the stack in such a way as materially to interfere with the passage of the combustion gases under action of the fan. Rather the exhausted air is introduced into the stack at the central region which would in any event be blocked out of the air stream by the cross sectional area of the motor.

Compressed air enters the motor through an axially disposed coupling 31 at the end of the

motor opposite the fan and is supplied by a flexible metal air hose 32 extending upwardly axially from the air motor and bent over to extend horizontally past the upwardly extended end of the upright frame member 12 to which it is anchored by a clamp 33. This end of the air conduit 32 is detachably joined by a coupling 34 to a compressed air hose 35 which, being beyond the path of the combustion gases, may be the usual rubber hose. It is contemplated that the length of hose 35 will be attached to a convenient outlet in the compressed air pipe line which is usually run about the interior of a round house as well as about the nearby outside track. The operation of the fan is controlled by a valve which may be conveniently located in the hose 35, at its terminal couplings, or at the compressed air pipe line outlets.

In Fig. 5 I have shown an alternative arrangement for my draft inducing device, wherein the air motor is turned about so that the fan comes at the top. This requires some rearrangement of details. The metal air conduit 32' is led downwardly along the inside angle of the upright 12' crossing radially to a side coupling 31' for the air feed to the motor. The lower struts 15' are secured at their inner ends to an extension 31a of the coupling member 31' for anchoring the bottom of the motor to the frame. The shroud 21, which corresponds to the outer shroud of Figures 1, 2 and 3, becomes the intermediate shroud 21', which in turn is enveloped by a third or outer shroud 36 generally cylindrical, but having a frusto conical bottom portion 37 terminating in an inwardly directed bottom flange 38 by which it is secured to the bottom portion of the air motor 20. The upper struts 17' are secured at their inner ends to the upper end of the shroud 21', passing through suitably arranged slots 39 in the upper end of the shroud 36. The path of the exhaust air discharged through the discharge ports in the casing portion 25, which faces the fan, is, as indicated by the arrows, first upwardly between the inner shroud 29' and the intermediate portion 27 of the motor casing, around the upper end of the inner shroud 29', downwardly between the shrouds 29' and 21' and then upwardly between the shrouds 21' and 36, discharging upwardly from the open upper end of the latter into the hub region of the fan. Thus releasing to atmosphere, the exhausting air has considerable upward velocity of its own and thereby does not put a material drag upon the hub portion of the fan. Also being discharged near the hub portion, which is relatively ineffective, it does not dilute or displace the hot combustion gases in the more effective region of the fan.

In the modification of Fig. 5, the guard ring 15' for the fan is rearranged to an upper position opposite the fan.

The advantages of the arrangement of Fig. 5 over that of the other figures is that the location of the fan above the motor eliminates some friction in the discharge side of the fan and hence tends to increase the fan efficiency somewhat, and it makes more feasible the use of the three shrouds which afford better circulation of the air over the bearing portions of the housing and provide three rather than two major air insulating spaces to protect the motor casing from the heat of the combustion gases. On the other hand, the frame and guard ring must be so proportioned that in fitting it into varying diameters and tapers of stacks, it will be insured that the fan will be

definitely below the top of the stack. This necessitates a relatively longer length for the long upright 12' than is required for the upright 12 of the preferred form, and thereby the overall length of the unit is increased by approximately the length of the motor. It also has the relative disadvantage of requiring a longer length for the compressed air conduit 32' which must be exposed to the heat of the combustion gases. Further, although the air cooling and insulation of the casing is improved, an additional shroud and some additional overall diameter therefor are made necessary.

In the operation of either of these forms of draft inducers, the air hose 35 is coupled to connect the motor with a compressed air line, and the unit is lifted up and set into the stack opening and allowed to descend under gravity until the tapering frame is lodged in the tapering stack. In the instance of excessively over-sized stacks, it may be that the frame will be suspended by the handle on the long upright frame member. It should be noted that since the unit is self-supporting in or on the locomotive stack, no mechanical means, such as clamps or bolts, are necessary to secure the draft inducer in operative relation thereto, even though the device may be used with several locomotives having different stack dimensions. The air control valve is then turned on to admit compressed air to the motor and drive the fan. When the draft inducer has served its purpose, the air valve is shut off and the device is lifted out of the stack by means of the handle which, being out of the path of the hot combustion gases and in the path of induced outside air, remains comparatively cool.

Because of the small overall dimension and the light weight of my draft inducer, it is not necessary to employ any crane mechanism for suspending or positioning the unit, nor is it restricted to any particular location because of the necessity of such crane suspension. Dependent only upon availability of a compressed air line, it can be applied to the firing of a locomotive anywhere in the round house or any other outside trackage. In fact, the small size and light weight of the draft inducer permits of its being conveniently stored on a locomotive whereby if an occasion arises, it may be employed anywhere away from terminal facilities where compressed air is available locally, or from the compressor of another nearby locomotive, or from stored and compressed air in the locomotive itself.

Not being dependent upon a fire in the locomotive, my draft inducer may be employed for cooling the fire box and boiler flues of the locomotive for inspection thereof, or work thereon, or it may be employed as a ventilator for the comfort of men working in the fire box.

The economical design and consequent low cost of my locomotive draft inducer makes it feasible for round houses and terminals generally to be equipped with an ample number of them so that, in view of the draft inducers being free of locational limitations in the round house, the number of locomotives which may simultaneously be fired at one time is dependent only on the number of draft inducers available at the terminal. It avoids the necessity of relocating locomotives in different stalls in a round house in order to bring each locomotive to be fired adjacent an available and more or less fixed draft inducer.

While I have described and illustrated these specific forms of my invention, I contemplate that many changes and substitutions may be

made without departing from the scope or spirit of my invention.

I claim:

1. A locomotive draft inducer adapted to be removably inserted in a stack through the open upper end thereof, comprising an air motor having a driven shaft, a fan on the shaft, a frame conformed to fit the interior of the stack and support the motor and fan centrally of the stack, an upwardly extending member of the frame protruding above the top of the stack, a handle extending outwardly from the protruding frame member and away from the path of the combustion gases issuing from the stack, and a compressed air feed conduit leading to the air motor and anchored to the protruding upright frame member.

2. A locomotive draft inducer adapted to be removably inserted in a stack through the open upper end thereof, comprising an air motor having a driven shaft, a fan on the shaft, a frame conformed to fit the interior of the stack and support the motor and fan centrally of the stack, an upwardly extending member of the frame protruding above the top of the stack, and a compressed air feed conduit leading to the air motor and anchored to the protruding upright frame member.

3. A locomotive draft inducer adapted for connection as a unit to the stack comprising an air motor, a fan carried thereby, the motor and fan being positioned in the path of hot combustion gases passing through the stack, conduit means supplying compressed air to the motor, an exhaust air passage from the motor, and passage means extending longitudinally of and surrounding the motor for carrying the exhaust air along the body of the motor for cooling the motor and insulating it from the surrounding hot combustion gases.

4. A locomotive draft inducer for removable insertion in the stack of a locomotive, comprising a set of three upright angle strips spaced about the interior of the stack to conform to the diameter and taper of the inside of the stack, upper and lower sets of struts extending radially inwardly from the respective upright strips, a vertically disposed air motor secured to the inner ends of the struts and thereby mounted centrally of the stack, an axial shaft on the air motor, a fan mounted on the shaft with its blades extending substantially to the wall of the stack, and a circular guard ring disposed opposite the fan and secured to each of the upright strips.

5. A locomotive draft inducer for removable insertion in the stack of a locomotive, comprising a set of three upright angle strips spaced about the interior of the stack to conform to the diameter and taper of the inside of the stack, upper and lower sets of struts extending radially inwardly from the respective upright strips, a vertically disposed air motor secured to the inner ends of the struts and thereby mounted centrally of the stack, an axial shaft on the air motor, a fan mounted on the shaft with its blades extending substantially to the wall of the stack, and a circular guard ring disposed opposite the fan and secured to each of the upright strips, one of the upright strips extending above the upper end of the stack for lifting the frame from the stack.

6. A locomotive draft inducer for removable insertion in the stack of a locomotive, comprising a set of three upright angle strips spaced about the interior of the stack to conform to the di-

ameter and taper of the inside of the stack, upper and lower sets of struts extending radially inwardly from the respective upright strips, a vertically disposed air motor secured to the inner ends of the struts and thereby mounted centrally of the stack, an axial shaft on the air motor, a fan mounted on the shaft with its blades extending substantially to the wall of the stack, a circular guard ring disposed opposite the fan and secured to each of the upright strips, one of the upright strips extending above the upper end of the stack for lifting the frame from the stack, and a compressed air supply conduit leading to the air motor and anchored to the protruding upper end of the said upright strip.

7. A locomotive draft inducer adapted for ready insertion as a unit into the stack comprising an air motor, a fan carried thereby, frame means for removably mounting the air motor within and centrally of the stack, the motor including a bearing housing and an air exhaust passage, a plurality of concentric shrouds surrounding the casing and forming passage means for leading exhaust air from the exhaust passage around and along the motor to cool the motor and insulate it from the surrounding combustion gases and for discharging the exhaust air into, and substantially centrally of, the combustion gases blown by the fan.

8. A locomotive draft inducer comprising an air motor, a fan thereon, frame means for removably mounting the motor and fan as a unit within a locomotive stack centrally thereof with the fan disposed at the lower end of the air motor, the air motor including a housing and an air exhaust passage adjacent its upper end, an inner shroud surrounding the casing and receiving air from the exhaust passage near its upper end and leading the air downwardly around and along the casing, and an outer shroud of larger diameter surrounding the inner shroud and providing an upward passage for the exhaust air insulating the casing and the inner shroud from the heat of the surrounding combustion gases blown by the fan, the passage formed by the outer shroud discharging the air upwardly at the upper end of the housing and into the combustion gases substantially centrally of the stack.

9. A locomotive draft inducer comprising an air motor, a fan thereon, frame means for removably mounting the motor and fan as a unit within a locomotive stack centrally thereof with the fan disposed at the upper end of the air motor, the air motor including a housing and an air exhaust passage adjacent its lower end, an inner shroud surrounding the casing and receiving air from the exhaust passage near its lower end and leading the air upwardly around and along the casing, an intermediate shroud of larger diameter surrounding the inner shroud and providing a downward passage for the exhaust air insulating the casing and the inner shroud from the heat of the surrounding combustion gases blown by the fan, and an outer shroud of larger diameter surrounding the intermediate shroud and providing a continuing upward passage for the exhaust air between the outer and intermediate shrouds and providing a further insulating space between the casing and surrounding combustion gases, the passage formed by the outer shroud discharging the air upwardly substantially centrally of the stack and at the hub region of the fan.

10. A locomotive drafter comprising a vertical fan, a motor for the fan substantially coaxial therewith, and a frame mounting the fan and

motor and exteriorly conformed and arranged for unattachedly and interiorly engaging by gravity the vertical stack of a locomotive and to be supported by the stack and in turn to support the fan centrally within the stack with the interior wall of the stack in proximity to the fan to cooperate therewith as the shroud therefor substantially to confine gas passing through the stack to the area swept by the fan, the fan, motor and frame constituting a pre-assembled device handleable as a unit for quick manual insertion into the stack axially thereof through the upper end thereof and for quick manual lifting upwardly therefrom.

11. A locomotive drafter which is pre-assembled and handleable as a unit for ready insertion down into, and ready removal by upward lifting from, the interior of the vertical stack of a locomotive, and which comprises a skeleton frame conformed to engage by gravity and be supported by the stack, a fan, and its motor, the frame carrying the fan and motor and, when inserted in the stack, mounting the fan and motor within the stack substantially coaxially thereof and in the path of the combustion gases passing through the stack with the stack circumscribing the fan and in close proximity to the sweep of the fan to cooperate therewith as a gas confining shroud for the fan.

12. A locomotive drafter which is pre-assembled and handleable as a unit for ready insertion down into, and ready removal by lifting up from, the interior of the vertical stack of a locomotive, and which comprises a skeleton frame to engage and be supported by the stack, a fan, and a compressed air motor therefor, the frame carrying the fan and motor and, when inserted in the stack, mounting the fan and motor within the stack substantially coaxially therewith and in the path of the combustion gases passing through the stack, with the stack circumscribing the fan in close proximity to its sweep to cooperate therewith as a gas confining shroud therefor, and a jacket for the motor forming a passage surrounding the motor, into which operating air from the motor is exhausted to protect the motor from the heat of the surrounding combustion gases and from which passage the exhausted air is passed into the gas stream.

13. A drafter constructed and arranged to be mounted within the stream of hot combustion gases which traverse the stack of a locomotive, comprising a fan for blowing the gases, a compressed air motor therefor, and a jacket forming a passage surrounding the motor into which passage expanded operating air is exhausted from the motor to shield the motor from the heat of the surrounding combustion gases and from which the air is discharged to effect continuous circulation of the air through the passage.

14. The combination with the vertical stack of a locomotive of a pre-assembled drafter handleable as a unit for ready insertion down into and readily withdrawal up from the interior of the stack, comprising a skeleton frame exteriorly conformed to engage the interior of the stack for unattachably mounting the frame in the stack, a motor carried by and mounted by the frame and disposed centrally and longitudinally of the stack, and a fan carried by the motor, the sweep of the fan extending into proximity to the interior surface of the stack whereby the stack cooperates with the frame to support the frame for ready removal and, by means of the frame, to

mount the fan and motor within the stack for ready removal and insertion as a unit with the frame, and whereby the stack cooperates with the fan as the circumscribing gas confining shroud therefor.

15. A locomotive drafter according to claim 10 in which, when seated in a stack, a portion of the frame protrudes handlewise above the stack near its margin whereby the drafter may be lifted out of the stack.

16. A locomotive drafter according to claim 10 in which the conformation of the frame is slightly conical whereby it will fit the slightly conical interiors of stacks of different diameters.

17. A locomotive draft inducer adapted for connection as a unit to the stack comprising an air motor, a fan carried thereby, the motor and fan being positioned in the path of hot combustion gases passing through the stack, conduit means supplying compressed air to the motor, and means for exhausting the air from said motor and causing it to flow along the body of the motor for cooling the same and insulating it from the surrounding hot combustion gases.

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