(No Model.) 2 Sheets—Sheet 1.

B. F. TAYLOR.

PNEUMATIC STACK FOR STEAM BOILERS.

No. 483,589. Patented Oct. 4, 1892.

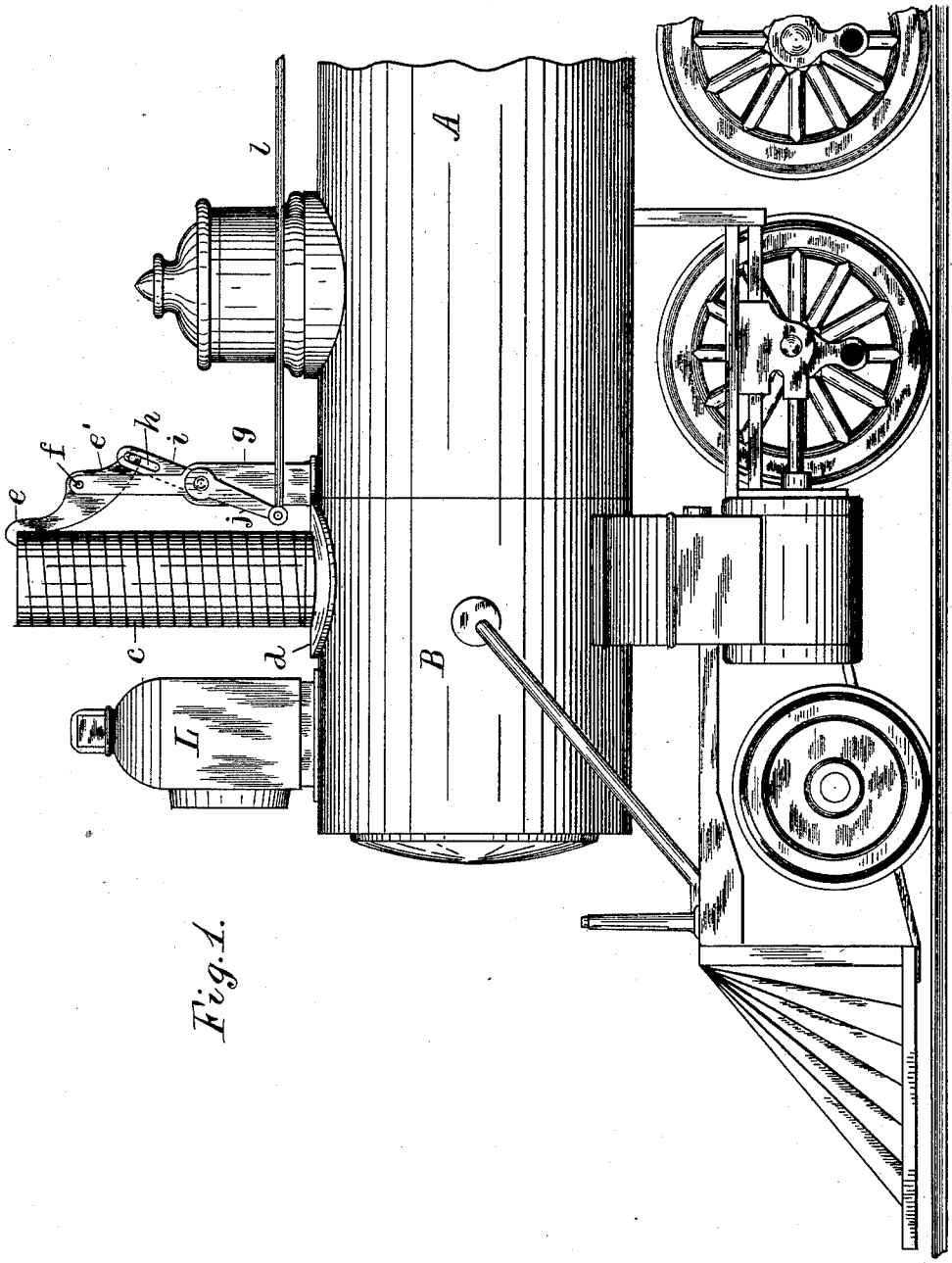


Fig. 1.

Attest:
J. Van Vest Jr.
L. Lee.

Inventor.
Benjamin F. Taylor, per
Crane & Miller, Attys.

(No Model.) 2 Sheets—Sheet 2.

B. F. TAYLOR.

PNEUMATIC STACK FOR STEAM BOILERS.

No. 483,589. Patented Oct. 4, 1892.

Fig. 4.

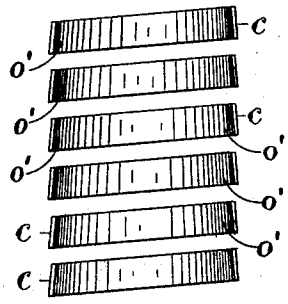


Fig. 6.

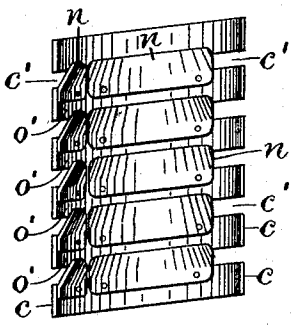


Fig. 2

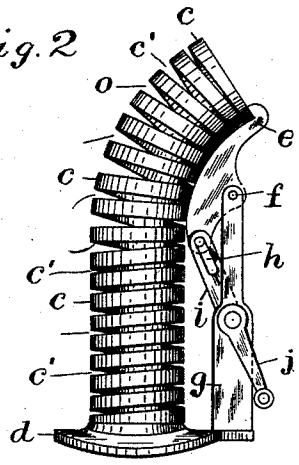


Fig. 5.

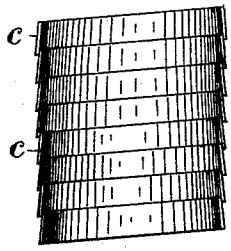


Fig. 7.

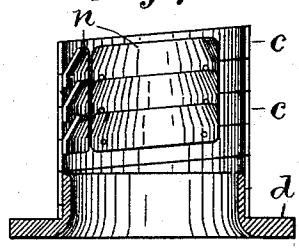


Fig. 8.

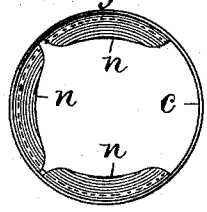
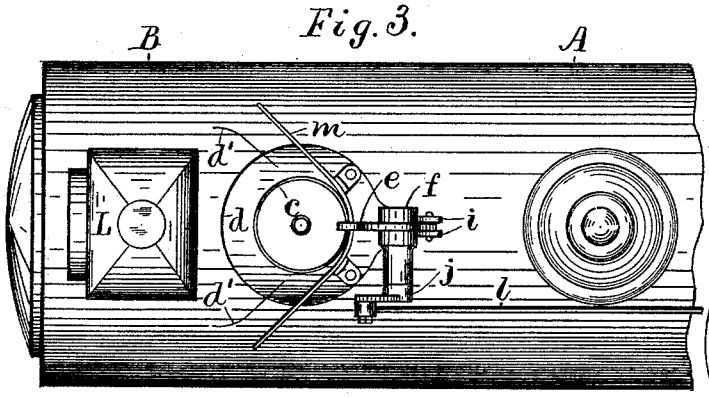
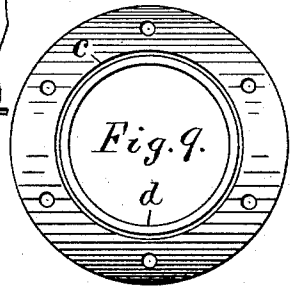


Fig. 3.





Attest:
J. Van Vest Jr.
L. Lee.

Inventor.
Benjamin F. Taylor,
per Crane & Miller, attys.

UNITED STATES PATENT OFFICE.

BENJAMIN F. TAYLOR, OF NEWARK, NEW JERSEY, ASSIGNOR OF ONE-HALF TO JAMES MOFFET, OF NEW YORK, N. Y.

PNEUMATIC STACK FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 483,589, dated October 4, 1892.

Application filed October 5, 1891. Serial No. 407,710. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. TAYLOR, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Pneumatic Stacks for Steam-Boilers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to furnish an improved smoke-stack for locomotives, marine boilers, and other constructions, whereby the natural draft of the smoke-stack may be greatly increased and the necessity of a contracted exhaust or artificial blast be correspondingly diminished.

It has been found necessary to make steam with the desired rapidity to employ a powerful forced draft in marine boilers, and it has also been found necessary in locomotives to greatly contract the exhaust-aperture from the steam-cylinders to produce the desired draft in the furnace.

My invention furnishes a construction for the smoke-stack whereby the currents of air to which it is exposed enter the stack at numerous points at an upward inclination and thus greatly promote the draft of the furnace with which the stack is connected. The stack is preferably formed of a spiral strip of metal wound into a normally-closed cylinder, which is capable of distension to form openings between the several coils. The movement of the vessel, locomotive, or other object upon which the furnace is transported creates a draft against the forward side of the stack, which draft enters the openings between the several coils and is deflected upward by beveling the strip of which the coils are formed or by attaching inclined deflectors to the inner sides of the coils. Both constructions are shown in the annexed drawings, in which—

Figure 1 represents my improvement attached to a locomotive, only the forward end of the locomotive being shown, with the smoke-stack erect. Fig. 2 is an elevation of the smoke-stack with the coils distended to form draft-openings. Fig. 3 is a plan of the forward end of the locomotive, showing a wind-collector applied to the stack. Fig. 4 is a vertical section of part of a stack formed of a beveled spiral strip with the coils separated to admit the draft. Fig. 5 is a similar section with the coils in contact. Fig. 6 is a vertical section, like Fig. 4, of a flat spiral strip with the coils separated and deflectors fixed within the same. Fig. 7 is a section of the same construction with the coils in contact. Fig. 8 is a plan of one of the coils with the front and side deflectors, and Fig. 9 is a plan of the bottom flange.

In Fig. 1, A represents the forward end of the locomotive-boiler, and B the smoke-box in front of the same. In the same figure the smoke-stack is shown formed of a flat strip of metal wound into spiral coils *c*. These coils are shown in contact with one another to form a closed stack, with the lower coil attached to a flange *d* upon the smoke-box B and the upper coil attached to the arm *e* of a lever *e'*, which is mounted upon a pivot *f* on a standard *g*. The standard is mounted at the rear side of the stack. The front side of the lever is curved from the point where the arm *e* is attached to the stack. A pin in the opposite end of the lever is fitted to a slot *h* in an arm *i*, which is moved at pleasure by the fireman through the agency of a crank *j* and rod *l*. When the boiler is not in motion, the coils are permitted to assume their normal position, (shown in Fig. 1,) thus forming a chimney with closed sides, which is best suited to furnish a draft under such conditions. When the boiler is in motion, the fireman pulls upon the rod *l*, and thus throws the top of the arm *e* upward and outward from the center of the smoke-stack. Such movement, as shown in Fig. 2, separates the coils of the stack and draws the top of the stack into contact with the curved surface of the lever *e'*, thus bending the top of the stack into an elbow-curve and causing the coils to separate much more upon the front than upon the rear side. The forward movement of the stack, which sometimes exceeds twenty miles an hour with marine boilers and fifty miles an hour with locomotive-stacks, throws numerous violent drafts of air into the openings *c'* upon the front side of the stack and such drafts of air are deflected upward by a suit-

able construction and produce a powerful draft within the furnace to which the stack is attached. Such operation is already well known in steam siphons and injectors, and its effect is thus readily understood and appreciated.

The drafts of air may be directed upward by beveling the strip of metal of which the spiral coils are formed, as shown in Figs. 4 and 5, the adjacent edges of the successive coils overlapping when pressed together, as shown in Fig. 5, and forming inclined surfaces to deflect the air when separated, as shown in Fig. 4. Such beveled coils would throw the drafts upward when entering upon any side of the stack, and when separate deflectors are applied to flat coils, as shown in Figs. 6 and 7, they may be applied separately within the front and sides of the coils or upon all sides of the interior by forming them of suitable shape.

To direct the air to the front side of the stack, where it is partially covered by the head-light or lantern L, (shown in Figs. 1 and 3,) a device for directing or controlling the access of air to the stack may be applied upon any side. Such a wind-controller is shown at *m* in Fig. 3, consisting of a plate of metal bent to encircle the rear side of the stack, with wings projected outwardly toward the front of the stack beyond the line of the lantern sides. The drafts passing the sides of the lantern, as indicated by the arrows *d'*, would thus be directed into the openings *c* between the coils as effectively as if the lantern were removed. Such wind-controller may, if desired, be made to rotate upon the bottom flange *d* of the stack, so as to have the wings presented in any desired direction.

In Figs. 6 to 9 the coil is shown formed of a flat strip of metal with separate deflectors *n*, affixed within the coils upon the front and sides, where the draft is most liable to enter. The draft entering the opening *c'* is thus thrown upward, as indicated by the arrows *o'*, the same as by the beveled strip in Fig. 4.

Arrows *o* are shown at both sides of Fig. 4, indicating the movement of the draft upward as it enters the opening *c'*, and it is obvious that with a stack thus constructed the draft of the locomotive when backing would not be impaired, but would be increased by the movement of the engine the same as when running forward. By fixing the separate deflectors *n* within the coils upon all sides of the same the same effect is produced by the entrance of drafts upon every side as when the coil is formed of the beveled strip shown in Fig. 4. It will be readily understood that the draft increases with the velocity of the structure to which the stack is attached, which produces the drafts entering the openings *c'*, and the natural operation of the stack, when in motion, with the coils separated, is thus to produce a strong suction upon the boiler tubes or passages, thus drawing air into the furnace and increasing the combustion in some degree as a forced draft. The invention applied to stacks of marine boilers thus reduces the necessity for a forced draft in a certain degree, and when applied to the stacks of locomotives diminishes in a still greater degree the necessity for contracting the exhaust-nozzle from the steam-cylinders. By enlarging the exhaust-nozzle in any degree whatever the back-pressure upon the steam-pistons is diminished, and a very great advantage is secured, as a back-pressure upon locomotives varies from ten to twenty pounds per square inch. Such back-pressure represents an enormous waste of power, which is saved in a greater or less degree by developing a natural draft in the smoke-stack.

Another great advantage results from introducing air into the smoke-stack to mingle with the gases before their discharge, as they are then discharged in a highly-diluted condition, and are thus rendered much less offensive both to sight and smell.

The gases discharged from an ordinary locomotive-stack are very offensive when they are wafted directly into the windows and ventilators of the passenger-cars, while their odor and character would be much less perceptible if thoroughly mingled with ten or twenty times their volume of air. In like manner the smoke and cinders when highly diluted with air are dissipated in a great degree, and the annoyance to the passengers is correspondingly diminished. The air entering the openings *c'* from the bottom to the top of the stack is obviously mixed with the escaping gases in the most intimate manner, and serves to dilute the same most effectively, and all the annoyances produced by the smoke, cinders, and gases may thus be diminished in a very large degree by the use of my invention. The wind-controller *m* (shown in Fig. 3) would obviously prevent the access of air to the rear side of the stack; but where the coils operate as deflectors upon the front, rear, and both sides such a wind-controller is not essential, as the drafts passing the head-light are in any case deflected more or less toward the stack and thus operate in the manner desired. By dispensing with the wind-controller *m* the stack is exposed to the free operation of blasts of air upon all sides, so that the open coils operate to produce a suction within the furnace whether the locomotive is going backward or forward, and whether the wind prevailing at the time is approaching the locomotive at the front side or from the rear, which may arise when the velocity of the wind exceeds that of the locomotive or vessel upon which the stack is used.

The apparatus shown in the drawings is adapted to first stretch the stack longitudinally to separate the coils and then to curve the top of the stack backwardly, and such backward curve is beneficial as it forms large openings *c'* in the front of the stack without materially separating the coils at the back, where they would perform no particular func-

tion when the drafts were entering upon the front side only. It is not, however, essential to the operation of my invention that the spirally-formed stack should be curved in order to perform its functions, and the mechanism for separating the coils may operate exclusively upon a straight line. It is obviously immaterial whether the coils of the stack be separated by raising the upper end or lowering the lower end. The former construction may be objectionable where locomotives are limited in height to pass underneath bridges, and it is obvious that the latter construction may be employed in such case by the inversion of the mechanism described herein or by any suitable means to distend the stack in a straight line. The coils may be attached to the flange or collar *d* at the stationary end by bolts, rivets, or by brazing thereto, and where the stack is distended downwardly the collar *d* (shown fitted within the end coils in Fig. 8) would be fixed by any suitable support at the upper end of the stack and the lower end moved over a similar collar of suitable length upon the boiler by which the smoke would be directed within the stack whether it was extended or compressed.

By reference to Fig. 2 it will be noticed that the backward inclination of the top of the stack operates in connection with the drafts of air entering the same to project the cinders toward the rear of the train, instead of vertically upward into the air, as is the case with the stacks now in use.

By my construction the cinders are projected backward over the cars in the train with such velocity that they would be prevented in great part from falling upon the cars and entering the windows, as is now the case. The same inclination also serves to improve the natural draft of the locomotive-stack, as it is well known that a blast blown directly across the top of a stack is injurious to the draft. By inclining the top of the stack backward, as shown in Fig. 2, the violent movement of the air over the same, which exists when the stack is moving rapidly, tends rather to assist and promote the draft than to hinder and obstruct it, as with vertical stacks.

My invention differs from others in having a continuous series of lateral draft-openings in the smoke-stack, the openings being inclined upwardly to expel the contents of the stack by numerous impulses from the external air, and it is not, therefore, essential that the series of lateral slanting apertures should be formed by a continuous coil.

I disclaim a single slanting opening in a chimney-stack, as such a construction would not perform the functions of my invention.

Where the stack is used as an outlet for a steam-exhaust pipe, and especially with locomotive-boilers, it is desirable that the top of the stack should be entirely open, as shown in the drawings annexed, to prevent any obstruction to the steam and gases. I have therefore made a special claim herein to such a stack with a free open top and having a continuous series of lateral draft-openings extended throughout its entire length.

It has heretofore been supposed that an opening in the bottom of a chimney would be injurious to the draft, and the lateral inclined openings heretofore used to promote draft have been (in ventilators of various kinds) confined entirely to the top or head of the ventilator and limited in number to six or eight openings. My invention required experiment to determine that draft-openings of any kind whatsoever in the bottom of a chimney would promote the draft, and my experiments have resulted in a discovery that such openings are highly advantageous, and my invention has therefore determined a fact which was never before known or utilized. I disclaim a series of lateral inclined draft-openings in the mere head of a device or chimney-pot, as such a construction is different both in its construction and operation from that which I employ.

Having thus set forth the nature of my invention, what is claimed herein is—

1. A smoke-stack consisting in a strip of metal coiled spirally with means for separating or closing the coils at pleasure, as set forth.

2. A smoke-stack consisting in a strip of metal coiled spirally, with means for separating or closing the coils at pleasure, and means for deflecting the drafts upward upon entering the openings, as set forth.

3. A smoke-stack consisting in a strip of metal coiled spirally and beveled as herein set forth, and means for separating and closing the coils at pleasure, as set forth.

4. The combination, with a smoke-stack consisting in a strip of metal coiled spirally, of a lever with curved face having an arm attached to the upper end of the smoke-stack, and means for moving the lever to bend the stack into contact with the curved surface, as set forth.

5. The combination, with a locomotive-boiler, of a stack consisting in a strip of metal coiled spirally with its lower end attached to the smoke-box, the upper end attached to an arm upon the lever *e'* for separating the coils, and the rod *l* with connection to the lever for moving the same at pleasure, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

BENJAMIN F. TAYLOR.

Witnesses:
THOS. S. CRANE,
HENRY J. MILLER.