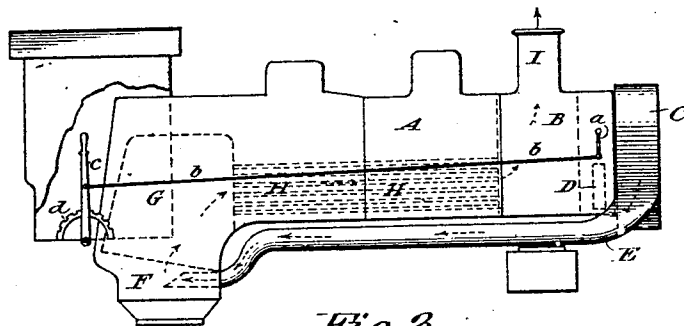
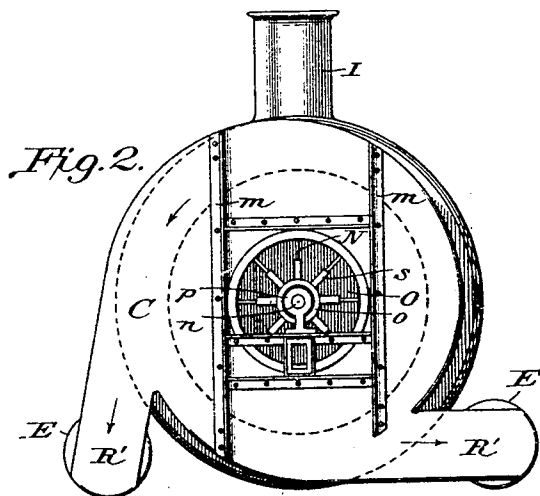
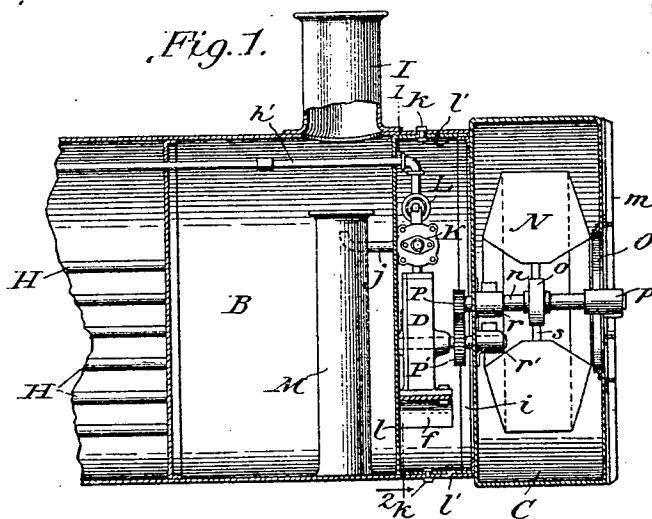


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J. J. DURAGE.
DRAFT FORCING MECHANISM.
APPLICATION FILED MAR. 31, 1904.

2 SHEETS—SHEET 1.



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No. 811,624.

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2 SHEETS—SHEET 2.

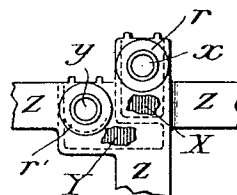
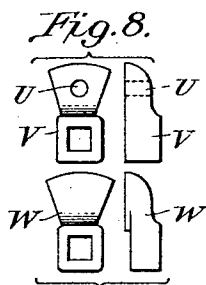
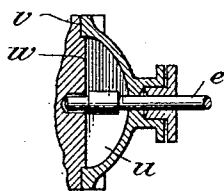
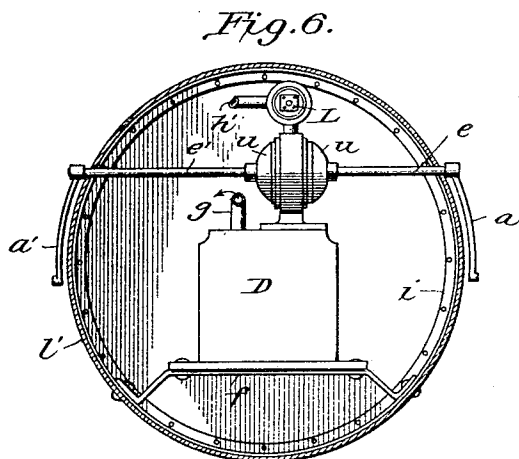
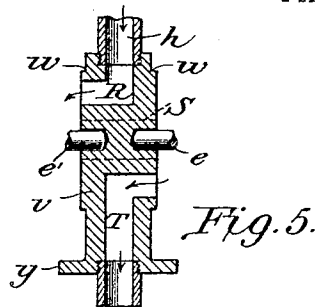
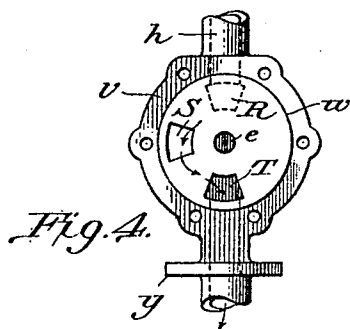


Fig. 7.

Fig. 10.

Fig. 9.

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UNITED STATES PATENT OFFICE.

JULES J. DURAGE, OF DULUTH, MINNESOTA.

DRAFT-FORCING MECHANISM.

No. 811,624.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed March 31, 1904. Serial No. 201,010.

To all whom it may concern:

Be it known that I, JULES J. DURAGE, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Draft-Forcing Mechanisms; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to draft-forcing mechanism, and has for its object the substitution of forced draft for locomotives in place of the induced draft, as now being produced by the cramped discharge of the exhaust-steam into the stack.

The induced-draft method in diminishing the openings of exhaust-pipes by a contrivance commonly known as a "nozzle," inducing the hot gases of combustion to follow in the wake of the discharging steam and again inducing the air to enter the fire-box through the ash-pan causes a back pressure upon the piston, thereby considerably decreasing the power of the locomotive. This mode of induction causes an irregular draft, being strongest at the end of each piston-stroke and weak at other times. To obtain a sufficient draft, therefore, the induction at the end of each stroke is of necessity exaggerated, causing a lifting of the fire, the throwing out of the stack of large quantities of unconsumed fuel dead or glowing, resulting in loss of consuming power, losses by fire, and damage to the rolling-stock in the marring of its condition by pelting cinders. The jarring of the machinery due to the violent exhaust also curtails the life of various parts of the locomotive, and the imperfectly-burned fuel emits foul gases, causing discomfort to passengers. For the purpose of doing away with these defects the apparatus hereinafter described is invented.

The apparatus is intended to provide sufficient air for the consumption of fuel by the expenditure of less power than was formerly lost by said back pressure. The volume of the draft is also automatically controlled from the cab of the locomotive in accordance with the length of the cut-off or the amount of steam used for motive or other purposes.

To meet these conditions, the apparatus consists of a blower of suitable size positioned in a housing having a central air-port and two peripheral air-exhaust ports; a steam-engine

of any suitable construction, but preferably of the commercially-known "Dake" type or pattern, for operating said blower; a valve mechanism for governing the admission of steam to said steam-engine, which valve mechanism is adapted to be automatically operated from the cab to increase or diminish the feed of steam to said engine in proportion to the use of steam for other purposes by the locomotive and to admit sufficient steam to said steam-engine to enable it to slowly operate the blower to maintain the fire while the locomotive is at a standstill, said valve mechanism also being provided with means for arbitrarily governing the feed of steam to said engine irrespective of the amount used for other purposes by the locomotive and adapted, if desired, to cut off the steam entirely from said engine, which arbitrary governing means may also be operated from the cab of the locomotive; a reducing-valve of any commercially-known pattern to fix the pressure required in the steam-engine, as desired, and two delivery-pipes to conduct the air from the blower to the ash-pan.

It also consists of certain other constructions, combinations, and arrangements of parts, as will be hereinafter described and claimed.

The apparatus is located for convenience at the front part of the locomotive, connected with the extension-front or pilot, or both.

As shown in the accompanying drawings and specification, a part of the extension-front is utilized for the reception of the fan-operating steam-engine, since the draft-regulating fixtures formerly carried in the extension-front will be entirely done away with.

In the accompanying drawings, Figure 1 shows a vertical longitudinal section of the extension-front of a locomotive-boiler and of a blower-housing attached thereto, also showing a side elevation of the blower, engine, gearing, automatic and reduction valves at the front end of the locomotive. Fig. 2 shows a front elevation of said housing and of the fan or blower with inlet-opening into said housing and two exhausts extending therefrom. Fig. 3 shows a side elevation, partly broken away, of a portion of the main body of the locomotive, showing the blower-housing, one of the draft-delivery pipes, and valve-controlling connections, the line of arrows showing the course of the draft. Figs. 4, 5, and 7, respectively, show an inside face elevation and vertical transverse section

of the automatic valve with cover removed and a vertical transverse section of one of the covers of said valve with the face-line of said valve. Fig. 6 is a vertical transverse section of the extension-front of said boiler on the line 1 2 of Fig. 1, showing in rear elevation the automatic valve, reduction-valve, steam and valve controlling connections inside of the extension-front. Figs. 8 and 10 show front and side elevations of valve-gates to main throttle and automatic throttle, respectively. Fig. 9 shows the bearings and oil-wells of the gear and pinion for driving the fan.

Referring now to the accompanying drawings, in the extension-front B, attached to the boiler A of any locomotive and separated by the boiler-head *l*, is inserted a cylindrical casing *l'*, closed on the end toward the boiler and provided at the other end with a circle of angle-iron *i*, to which the blower-housing C is fastened. Inside of this casing *l'* and proportionately to the eccentric axis of the blower-housing C and the centers *x* and *y* of the gear and pinion P and P' is stationed the engine D on the base *f*. The casing *l'* is fastened to the extension-front B by the bolts *k*. To the angle-iron ring *i* is fastened the blower-casing C as nearly concentric therewith as the construction and outline of said housing will permit. Said housing is provided with exhaust-conduits R', extending at a tangent to the periphery thereof. The front face of said housing is strengthened by the framework *m m* and contains an adequate air-inlet O and the bearing *p*. The rear face of said housing, toward the boiler, carries the frame Z Z with the bearing *r'* of the gear P' and the bearing *r* common to the pinion P and the fan-shaft *n*. These two bearings conform to the centers *x* and *y*, respectively, of the fan-shaft and engine-shaft. Said bearings *r* and *r'* are located inside of the blower-housing C and have oil-wells X and Y. To the shaft *n* is keyed the blower or fan consisting of the hub *o*, spokes *s*, and buckets N.

To automatically control the flow of air proportionately to the amount of steam used in the cylinders of the locomotive, to secure a motion of the fan while at temporary rest, and an arbitrary control to open from wide to an entire close, and have these conditions prevail either in going backward or forward, the valve K is designed. The body of this valve, having a steam-inlet *h*, contains the openings R, S, and T. The openings R and T lead out one to the rear and one to the front face of the valve-body, while the opening S leads entirely through said body. Now the steam entering through R will pass to the other side through the opening S and thence to the engine through the opening T. Upon the two faces of the circular part *w* are formed shoulders to form seats for valve-covers, as *u*, which are screwed or bolted to

the body of the valve. In passing through the opening R the flow of steam is controlled by the valve-gate W, which opens or closes, partly or wholly, the opening R, governed by it. Said gate is rigidly secured inside of said cover to the square portion of the shaft *e'*, which is arbitrarily controlled by the crank-arm *a'* from the cab. This regulates the general admission of steam through the pipe *h'* from the boiler to the valve in quantities as desired. As stated before, the steam thus admitted passes through port S to the opening T, which is closed or opened by the valve-gate V. On the forward motion of the locomotive at full stroke this port T is habitually open, and in cutting off steam from the cylinders on the quadrant *d* the gate V, rigidly fixed on a shaft *e*, similar to the shaft *e'*, but controlled by the crank-arm *a* and connecting-rod *b*, attached to the reverse-lever *c* in the cab, proceeds to close, becoming entirely closed when the reverse-lever is at the center. Pulling the reverse-lever farther in backing up, the valve-gate V will gradually uncover the port T until at full stroke it is again wide open, while standing with the reverse-lever at the center the vent U in the valve-gate V permits the blower to work slowly. The reduction-valve L, of any commercial pattern well known to the art, is used to obtain a regular pressure in the engine D regardless of what the boiler-pressure may be, while the direct supply through the opening R may be controlled or shut off when firing.

The steam-pipe *h'* takes steam from the boiler directly or from some source convenient, while the exhaust-pipe *g* leads in or to the locomotive-exhaust M, which is shown without the customary nozzle.

The operation of the apparatus may be given generally as follows: Steam passes from the boiler through the steam-supply pipe *h'*, thence through the reduction-valve L, thence to the automatic valve K, thence to the engine D, passing out through the exhaust-pipe *g*. The motion thus obtained is transmitted through the gearing P' P to the blower N and the air-current conducted from thence through the pipes E to the ashpan F. The air passing to and through the fuel consumes the same in the fire-box G, the hot gases passing through the flues H to the extension-front B and thence to the air through the stack I.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In draft-forcing mechanism the combination with a locomotive-engine, of a casing positioned in the boiler extension-front thereof; a fan-driving engine mounted in said casing, a housing mounted on the forward end of said casing, a rotary fan mounted in said housing and geared to said engine, air inlet

and exhaust ports in said housing, said exhaust-ports communicating exterior to the jacket of the boiler with the ash-pan and fire-box of said locomotive, means for automatically and arbitrarily governing the speed of said fan-driving engine, substantially as described.

2. In draft-forcing mechanism, the combination with a boiler, fire-box and ash-pan, of a fan-housing provided with feed and exhaust ports, a rotary fan mounted in said fan-housing, an engine provided with suitable feed and exhaust ports and connected to said fan for revolving the same, a steam-conducting conduit extending from said boiler into said engine, a valve interposed in said steam-conducting conduit and adapted to govern the admission of steam to said engine and comprising a steam-conduit provided with two valve-gates adapted either simultaneously or singly to govern the passage of steam through said conduit, one of said gates being adapted in closed position to entirely close said conduit and the other of said gates in closed position being adapted only to reduce the capacity of said conduit, means for operating the first said gate arbitrarily, means for operating the second said gate automatically, and air-conducting conduits connecting the exhaust-ports of said fan-housing with said ash-pan, substantially as described.

3. In a draft-forcing mechanism, the combination with a locomotive of an engine-hous-

ing positioned in the extension-front of the locomotive, an engine positioned in said housing, a steam-conducting conduit extending from the boiler into said engine, a valve interposed in said conduit and provided with two gates adapted either simultaneously or singly to reduce the capacity of said conduit and one of said gates being further adapted to entirely close said conduit, governing means connecting the other one of said gates with the reverse-lever of said locomotive and adapted to be operated by said reverse-lever when said lever is at any position off the center, governing means extending from the first said valve to the cab of said engine and adapted to be arbitrarily operated independently of said reverse-lever, a pressure-reducing valve interposed in said conduit between the boiler and said valve, a fan-housing secured to said engine-housing and provided with an inlet and exhaust ports, a rotary fan mounted in said fan-housing and connected to said engine, and air-conducting conduits communicating with the exhaust-ports of said fan-housing and with the ash-pan chamber of said locomotive, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

JULES J. DURAGE.

Witnesses:

JAMES T. WATSON,
WILLIAM J. STEVENSON.