No. 693,209. Patented Feb. 11, 1902.

L. ATWOOD.

LOCOMOTIVE.

(Application filed Jan. 21, 1901.)

(No Model.) 2 Sheets—Sheet 1.

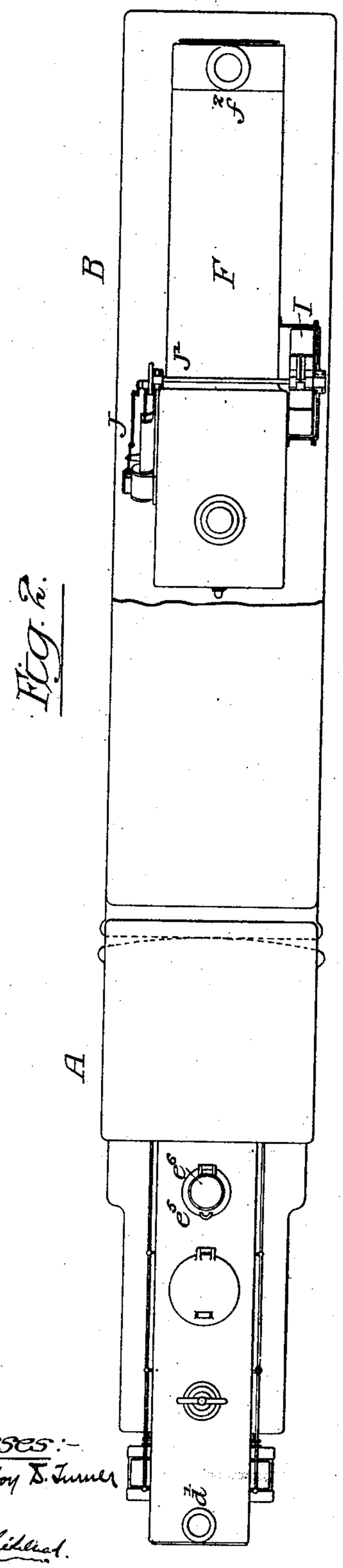

Fig. 2.

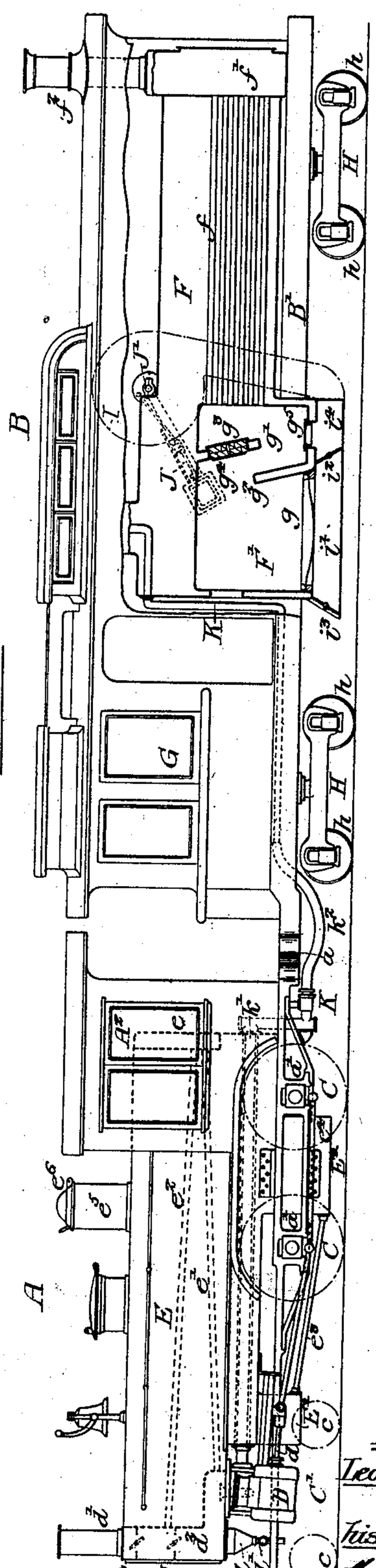

Fig. 1.

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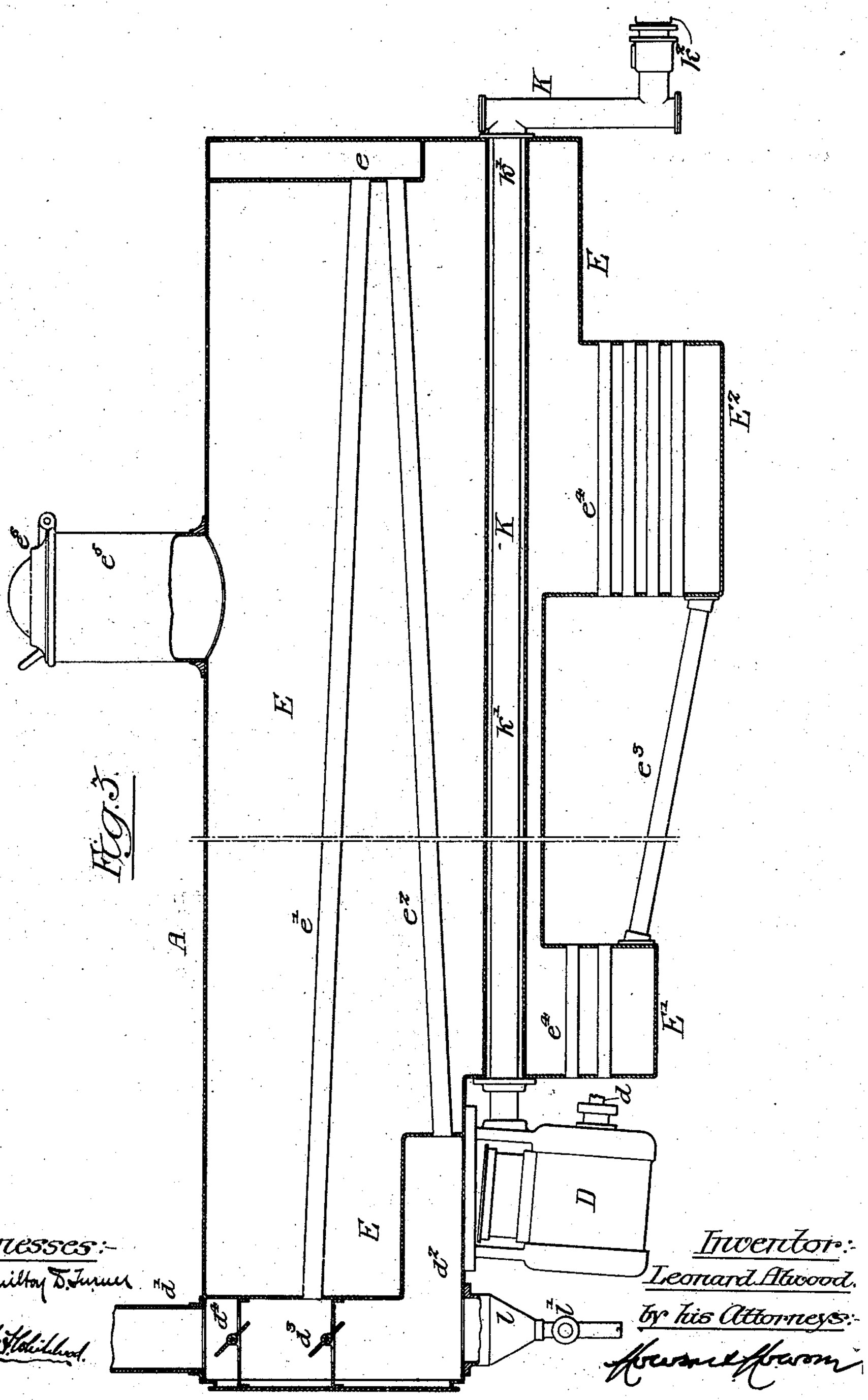

FIG. 3.

UNITED STATES PATENT OFFICE.

LEONARD ATWOOD, OF PHILADELPHIA, PENNSYLVANIA.

LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 693,209, dated February 11, 1902.

Application filed January 21, 1901. Serial No. 44,082. (No model.)

To all whom it may concern:

Be it known that I, LEONARD ATWOOD, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Locomotives, of which the following is a specification.

The object of my invention is to improve the construction of locomotives, especially those of the narrow-gage type, whereby a large fire-box and boiler can be used and in which the weight of the water-tank can be utilized to give the necessary traction to the driving-wheels.

A further object of the invention is to so construct the locomotive as to enable it to turn sharp curves and to so combine the water-tank and the exhaust-pipes from the engine that the steam will be readily condensed.

These objects I attain in the following manner, reference being had to the accompanying drawings, in which—

Figure 1 is a side view, partly in section, illustrating my improved locomotive. Fig. 2 is a plan view. Fig. 3 is a longitudinal sectional view of the water-tank.

I have illustrated my invention in connection with locomotives of the narrow-gage type, and at the present time it is especially adapted to this type; but it will be understood that it can be used on broad-gage locomotives as well.

The locomotive is made in two sections, A and B, coupled together at *a* in any suitable manner, the same as the tender is coupled to a locomotive of the ordinary type. The section A has a frame A′ and boxes *a′* for the driving-wheels C C, connected to the piston-rod *d* of the steam-cylinders D in the ordinary manner common to this type of engine.

c c are the wheels of the forward truck C′, which is made in the ordinary manner.

d′ is the stack for the passage of exhaust-steam from the cylinders, and A^2 is the cab at the rear of the section A.

On the frame A′ is the water-tank E, which will be fully described in detail hereinafter.

B′ is a car-frame, on which is mounted the boiler F and the coal or wood compartment G. This car-frame is supported by two trucks H H, having wheels *h* of the size of the ordinary car-wheels used on freight-cars. By this construction I am enabled to make the car-frame very low, and the fire-box F′ of the boiler can be placed between the sides of the car-frame and sufficiently near the surface of the road-bed to prevent the structure being top-heavy. This is one of the great points which must be overcome in constructing locomotives for narrow-gage tracks. Furthermore, by this construction I am enabled to obtain as large a grate-surface on a narrow-gage locomotive as is found on the ordinary wide-gage locomotive and without materially widening the structure.

Heretofore the great difficulty in constructing the fire-box of narrow-gage locomotives has been that the locomotive had to be set so low, and consequently the fire-box had to be placed either between the frames of the locomotive or at the rear of the drivers. The first form gave very little room for the fire-box, and the second construction placed the majority of the weight at the rear of the locomotive, and in this case even the grate-surface could not be materially increased.

The boiler F has the ordinary longitudinal tubes *f* for the products of combustion, and the chamber *f′* communicates with the smoke-stack f^2.

The fire-box is divided into the fire-chamber proper, *g*, and the combustion-chamber *g′*, which communicates with the flues *f*.

g^2 is a bridge-wall, and g^3 is the deflector extending down from the crown of the fire-box back of the bridge-wall and in front of the ends of the tubes, so that the products of combustion will pass from the fire-box in a circuitous path through the combustion-chamber to the tubes. In this deflector is a detachable section g^4, preferably made of fire-brick reinforced with plates, so that access may be had to the tubes when it is necessary to clean or repair them. In the opposite end of the boiler-shell is the ordinary opening, so that access may be had to that end of the tubes. The bridge-wall g^2 and deflector g^3 are made hollow and communicate with the boiler proper. In the bottom of the combustion-chamber is a manhole-opening provided with a suitable cover g^5, which can be removed when it is necessary to remove the soot and ashes from the combustion-chamber.

Directly under the grate *i* is an ash-pit *i′*, having dampers i^2 i^3, one at one end of the ash-pit and the other at the opposite end.

The ash-pit communicates with the fan-blower I through a tube i^4, so that air under pressure can be admitted to the ash-pit to create a forced draft. The draft can be regulated by the dampers i^2 i^3, as desired.

I prefer to drive the blower I by means of an independent engine J, mounted in the present instance on the opposite side of the locomotive to the blower I, and the connecting-rod of this engine is attached to a crank on a transverse shaft J', on which the blades I' of the blower I are mounted. This engine is driven by a special steam-supply from the boiler.

Other forms of blowers may be used without departing from the main features of my invention.

The water-tank E in some instances may simply be a plain tank placed on the frames A' of the driving-wheel section of the locomotive; but I prefer the form of tank shown in Figs. 1 and 3. On one end of the tank is a flue d^2, forming communication between the exhaust-passage of the cylinder and the stack d', and in this flue are dampers d^3 d^4, which regulate the passage of the exhaust-steam. At the opposite end of the tank is a chamber e, which communicates with the upper and lower ends of the chamber d^2 through diagonal pipes e' e^2. If the damper d^3 is closed, the exhaust-steam does not pass directly through the chamber d^2 to the stack, but through the pipes e^2, chamber e, and returns through the pipe e' to the chamber d^2, above the damper d^3, to the stack, and the damper d^4 can be so adjusted as to regulate the escape of steam to the stack.

One great advantage of constructing the water-tank and steam-exhaust in the manner shown is that when the locomotive is standing at a station or passing through a tunnel the upper damper d^4 can be closed, so as to prevent the escape of steam, the exhaust-steam in this case entering the chambers and passages and a certain proportion will be condensed.

The main steam-supply pipe K from the boiler to the cylinders of the locomotive is made in three sections, the section k being on the section B of the locomotive, the section k' being on the section A, and the section k^2 forming a flexible coupling between the section k and the section k'. The section of the pipe k' extends, preferably, through a passage in the lower portion of the tank E, as shown in Fig. 3, to the steam-chest of the cylinders. This pipe is preferably jacketed, so as to prevent condensation as much as possible of the steam in passing from the boiler to the cylinder.

The tank E has two depending portions E' E^2, which extend between the side frames A' of the section A, and these depending portions are connected by a pipe e^3, so as to allow for the proper circulation of water in the tank, and in the depending portions E' E^2 are a series of longitudinal flues e^4, open at both ends, so as to allow for the passage of air to cool the water in the tank to a certain degree. By this construction I am enabled to materially decrease the exhaust of live steam from the stack, as a majority of the steam will be condensed. The water of condensation will be received in the pocket l and can be allowed to escape through the valve l', as desired. The tank has a filling-opening e^5, provided with a cover e^6, which can be thrown back when it is desired to fill the tank with water.

By the above description it will be seen that by locating the boiler on a structure independent of the driving-wheels I am not limited in the area of the boiler and grate by the driving-wheels and the narrow frame, but can increase the boiler and the grate to equal in size the ordinary boilers and grates of the wide-gage locomotives now in use. At the same time I can place sufficient weight on the driving-wheels that they will have the desired traction by utilizing the water-tank for this purpose, and, furthermore, by allowing the exhaust-steam to pass through tubes in the water-tank I can condense the greater portion of the exhaust-steam, and by the arrangement above described I can construct a powerful engine either of the narrow or broad gage type, which will be able to accommodate itself to the sharp curves of the roadway.

I claim as my invention—

1. The combination in a locomotive made in two sections coupled together, the one section having the frame carrying the driving-wheels and supporting the water-tank, cylinders mounted on the frame and having their pistons connected to the driving-wheels, condensing-tubes in the water-tank communicating with the exhaust-steam passages from the cylinders, and a boiler carried by an independent car and coupled to the cylinders, substantially as described.

2. The combination in a locomotive made in two sections coupled together, one section carrying the boiler and the fire-box, the other section having the driving mechanism, driving-wheels, steam-cylinders and water-tank mounted thereon, means for connecting the steam-cylinders to the boiler, and an exhaust-chamber coupled to the cylinders, a stack, flues in the water-tank, and valves or dampers so arranged that the steam may either pass directly through the steam-chamber to the stack or through the flues, substantially as described.

3. The combination in a locomotive of two sections coupled together, one section having a low frame, a boiler carried on said frame, the fire-box of said boiler extending between the members of said frame, a stack on one end of the boiler, steam-cylinders and driving-wheels carried on the other section, a water-tank mounted on the frame of said section, a stack thereon, a pipe coupling the said cylinders to the boiler, tubes extending through the water-tank and communicating with said second stack, valves or dampers for

directing the exhaust-steam either through the tubes in the water-tank or directly to said stack thereon and a damper for cutting off the passage of steam to the stack, substantially as described.

4. The combination of a frame, driving-wheels mounted on said frame, steam-cylinders also mounted on the frame and connected to the driving-wheels, a water-tank mounted on the frame and having two depending portions, tubes in each portion and circulating-tubes connecting the portions, an exhaust-steam chamber communicating with the cylinders, and condensing-tubes in the water-tank communicating with the said steam-chamber, substantially as described.

5. The combination in a locomotive, of a frame, driving-wheels on the frame, cylinders also on the frame connected to the driving-wheels, a water-tank carried by the frame and having a chamber for the exhaust-steam communicating with the cylinders, and a stack communicating with the exhaust-steam chamber, a chamber at the opposite end of the tank, two sets of tubes extending from one steam-chamber to the other, a valve or damper in the first steam-chamber so that the steam exhausting can be either passed directly to the stack or indirectly through the tubes in the water-tank, substantially as described.

6. The combination in a locomotive, of a frame, driving-wheels on the frame, cylinders also on the frame connected to the driving-wheels, a water-tank carried by the frame and having a chamber for the exhaust-steam communicating with the cylinders, and a stack communicating with the exhaust-steam chamber, a chamber at the opposite end of the tank, two sets of tubes extending from one steam-chamber to the other, a valve or damper in the first steam-chamber so that the steam exhausting can be either passed directly to the stack or indirectly through the tubes in the water-tank, with a flue at the stack for cutting off the exhaust of steam, substantially as described.

7. The combination in a locomotive, of a frame, driving-wheels on the frame, cylinders also on the frame connected to the driving-wheels, a water-tank carried by the frame and having a chamber for the exhaust-steam communicating with the cylinders, and a stack communicating with the exhaust-steam chamber, a chamber at the opposite end of the tank, two sets of tubes extending from one steam-chamber to the other, a valve or damper in the first steam-chamber so that the steam exhausting can be either passed directly to the stack or indirectly through the tubes in the water-tank, with a flue at the stack for cutting off the exhaust of steam, and a receiving-pocket depending from the exhaust-steam chamber to receive the water of condensation, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LEONARD ATWOOD.

Witnesses:

WILL. A. BARR,

JOS. H. KLEIN.