

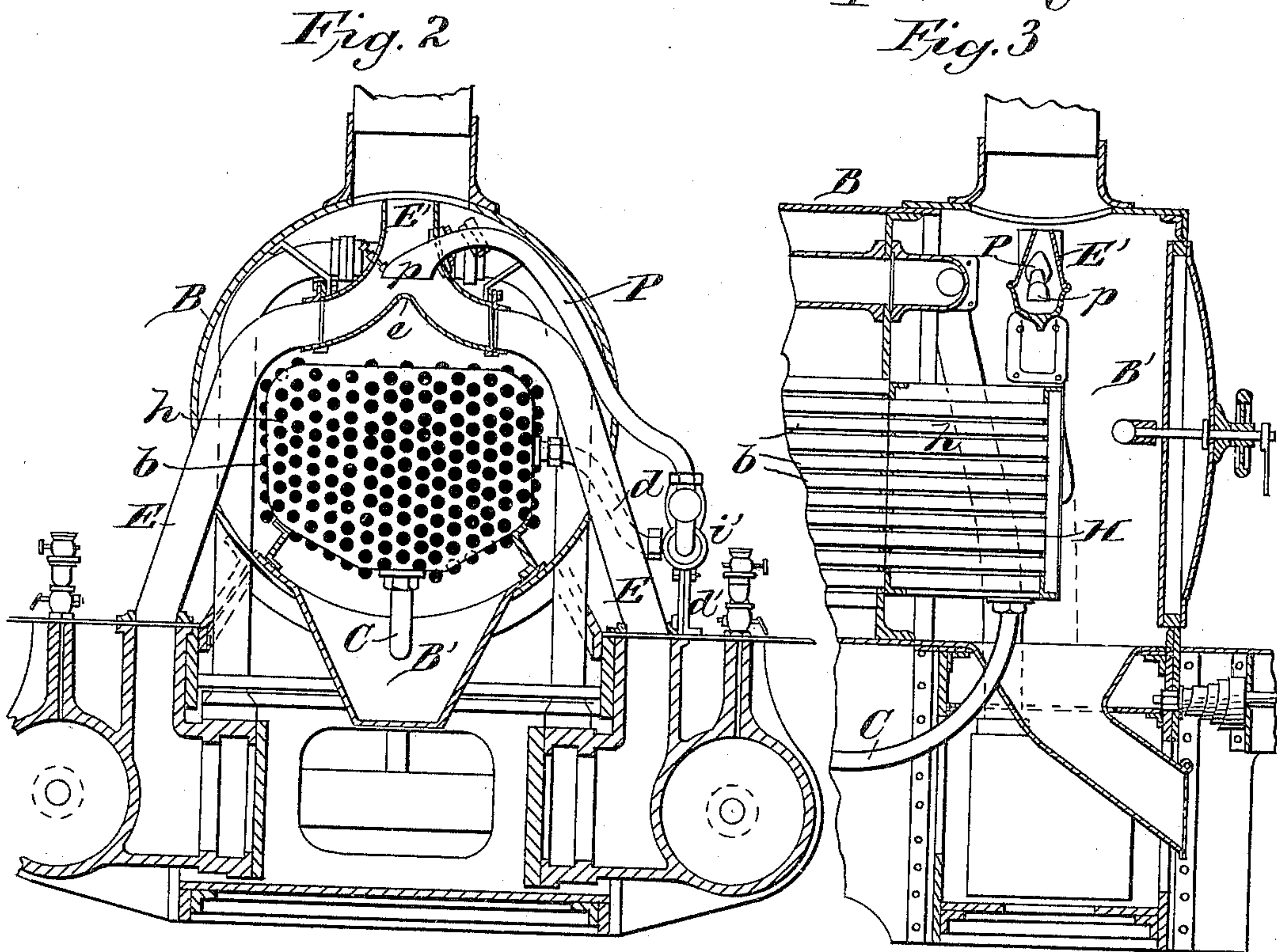
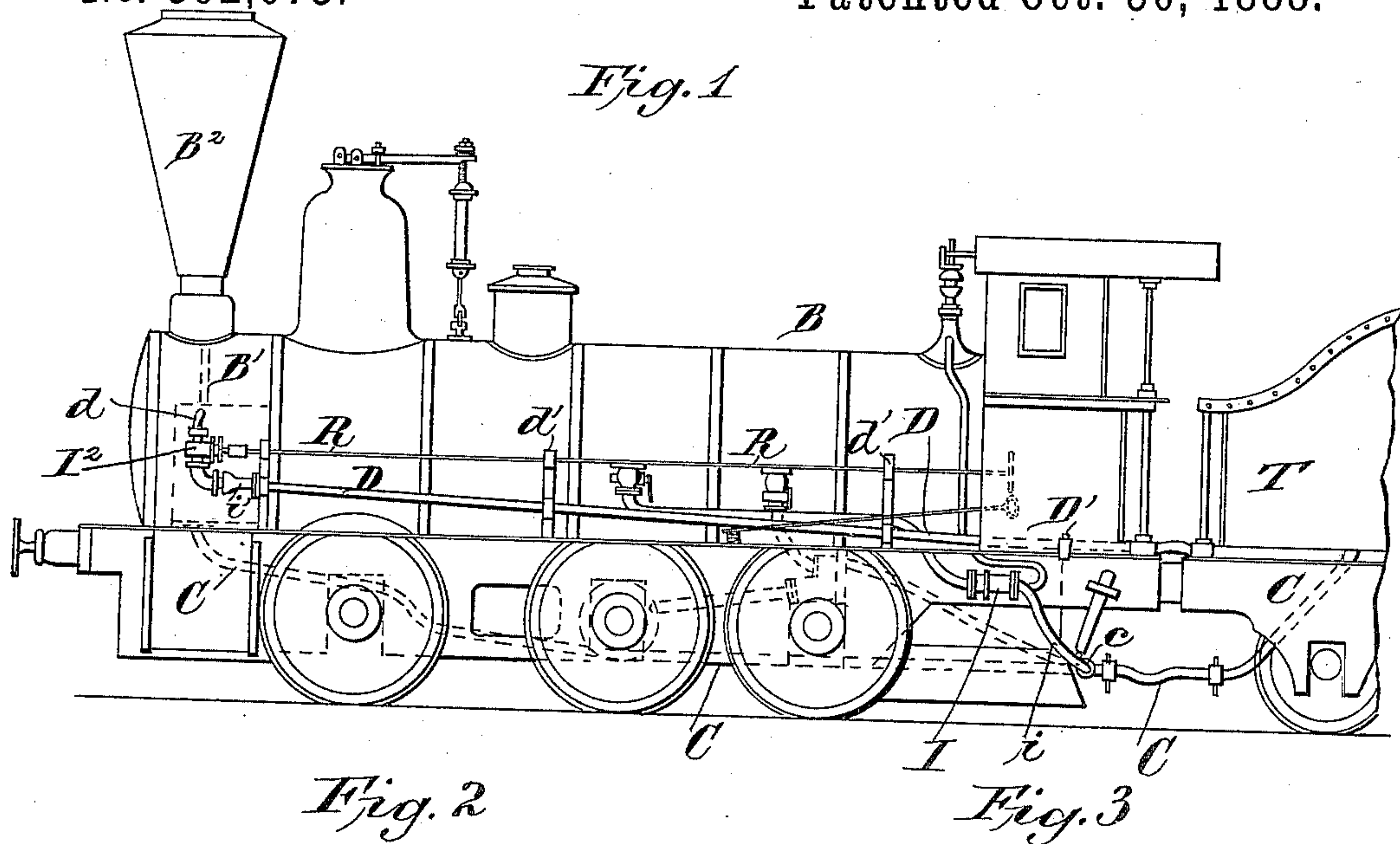
(No Model.)

3 Sheets—Sheet 1.

L. SELIGMANN.
HEATING FEED WATER.

No. 392,073.

Patented Oct. 30, 1888.



Witnesses:
C. M. Gallahue.

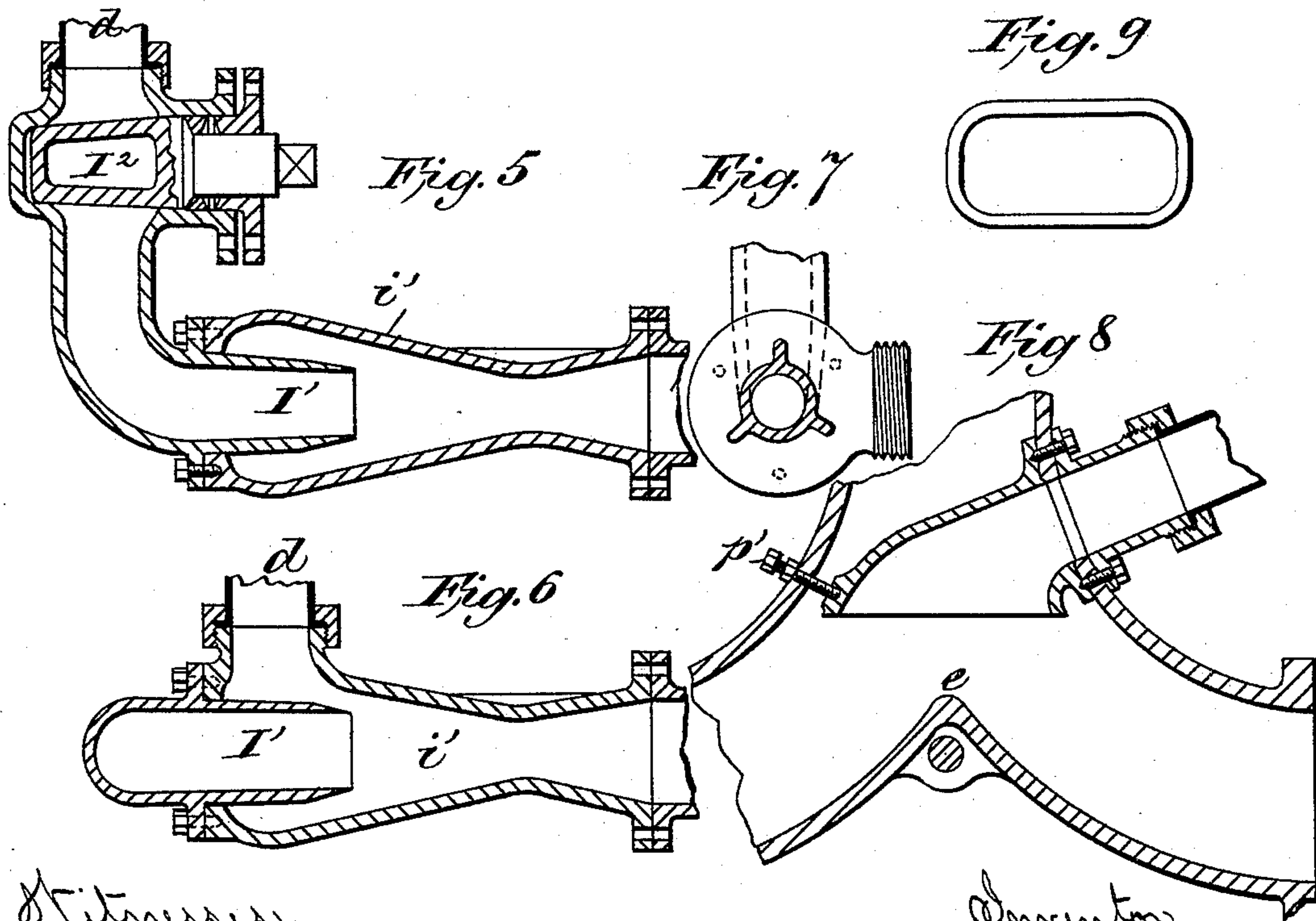
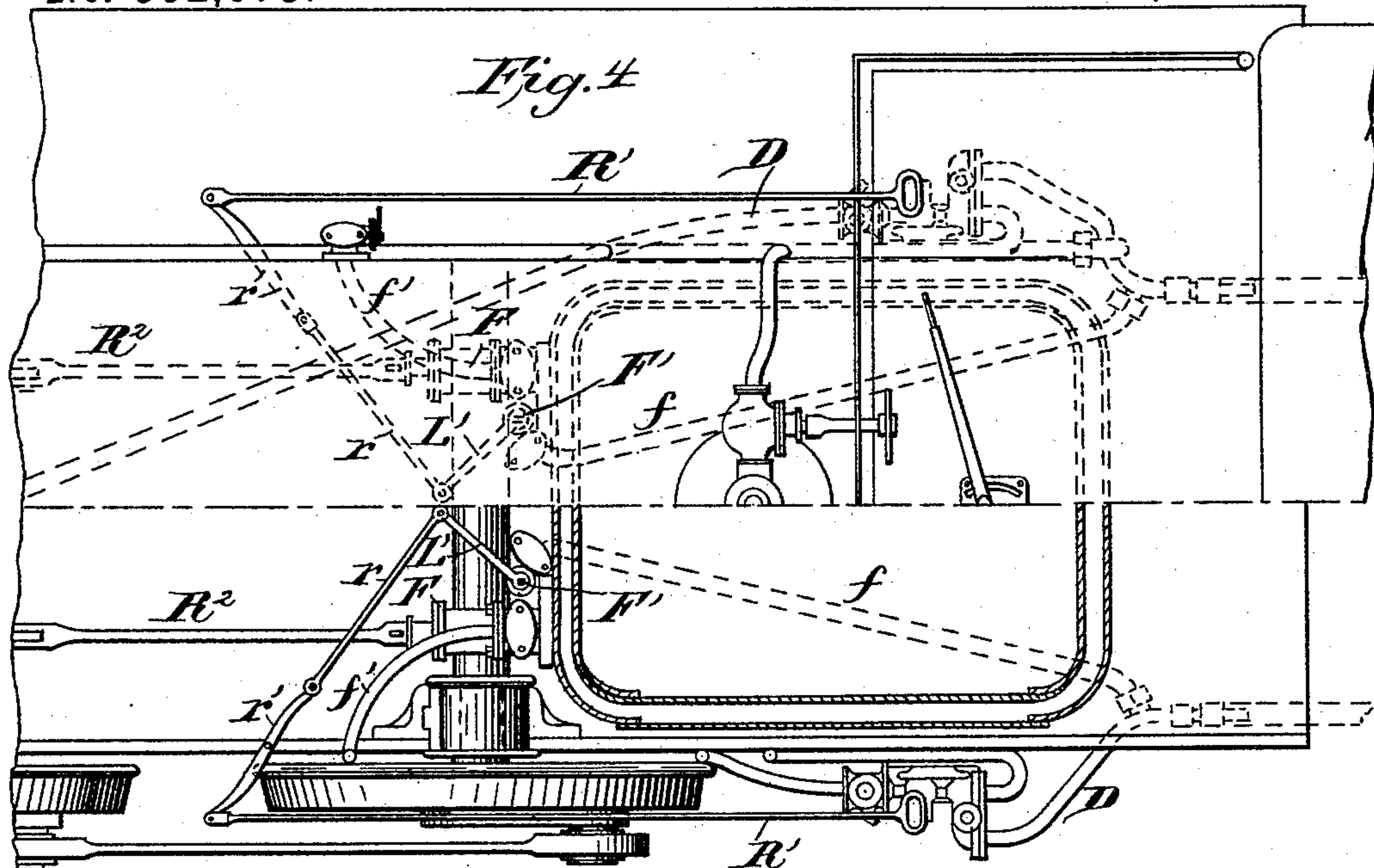
J. H. Schott.

Inventor,
Leon Seligmann
per *Kury & Co.* Att'y

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Witnesses.
C. M. Hallahan,
J. H. Schott.

Inventor.
Leon Seligmann.
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(No Model.)

3 Sheets—Sheet 3.

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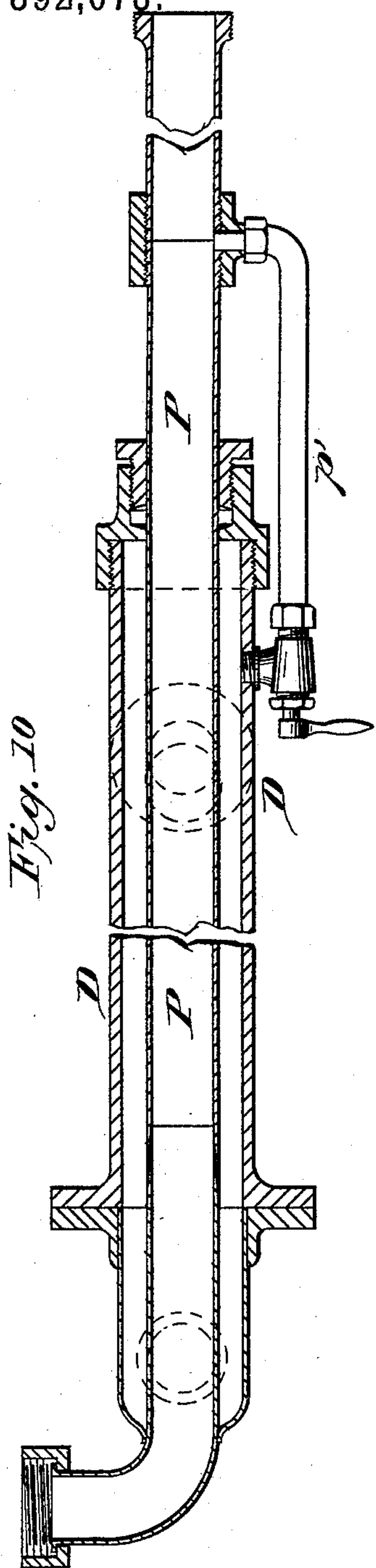
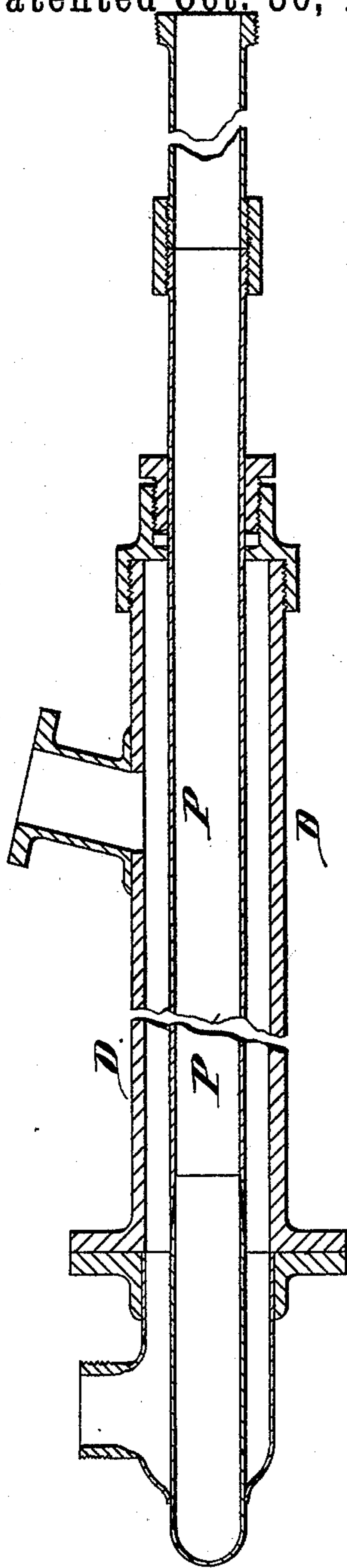


Fig. 11



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C. H. Hallahan.
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UNITED STATES PATENT OFFICE.

LEON SELIGMANN, OF SARATOV, RUSSIA.

HEATING FEED-WATER.

SPECIFICATION forming part of Letters Patent No. 392,073, dated October 30, 1888.

Application filed March 2, 1888. Serial No. 265,940. (No model.)

To all whom it may concern:

Be it known that I, LEON SELIGMANN, a subject of the Czar of Russia, and a resident of Saratov, Russia, have invented certain new and useful Improvements in Heating Feed-Water, of which the following is a specification.

This invention relates to feed-water heaters for locomotives, and it has for its object to provide efficient means for preheating the feed-water with a view to economizing fuel.

To these ends the invention consists in the combination, with the locomotive-boiler, of a multitubular feed-water heater arranged in front of the boiler within the smoke-box in such a manner that the tubes of the heater form a continuation of the boiler-tubes, and in combination therewith of suitable connections between the heater and tender and between said tender and the water-space of the boiler, substantially as hereinafter described, and as set forth in the claims.

The invention further consists in the combination, with the feed-water heater and the circulating-pipes, of an injector and means for working the injector with the exhaust-steam of the engines, or a portion of such exhaust-steam to accelerate the circulation of the feed-water, substantially as hereinafter fully described, and as set forth in the claims.

The invention further consists in the combination, with the feed-water heater, the tender, the circulating-pipes, and the injectors for feeding the water to the boiler, of feed-pumps operating to feed the preheated water to the boiler when such water has acquired a temperature higher than that compatible with the good operation of the feed-injectors, substantially as hereinafter described, and as set forth in the claims.

The invention further consists in certain structural features and combinations of parts, substantially as hereinafter fully set forth, and pointed out in the claims.

Referring to the drawings, Figure 1 is an elevation of a locomotive to which my improvements are applied. Fig. 2 is a vertical transverse section taken through the smoke-box of a locomotive, showing the feed-water heater and its connections and the exhaust-steam pipe leading to the injector in elevation. Fig. 3 is a longitudinal vertical section of the

front portion of a locomotive, illustrating a portion of my improved feed-water-heating devices. Fig. 4 is a partial plan and partial horizontal section of a portion of a locomotive, showing the feed-pumps and connections and means for operating the same. Figs. 5, 6, and 7 are detail views, drawn on an enlarged scale, of the injector worked by the exhaust-steam. Figs. 8 and 9 are like views of the exhaust-steam pipe connected with the injector. Figs. 10 and 11 are longitudinal sections, also drawn on an enlarged scale, of a modification in the arrangement of the circulating-pipes, whereby the injector may be dispensed with.

In the drawings, B indicates the locomotive-boiler; *b*, the fire-tubes thereof; B', the smoke-box, and E the exhaust-steam ducts or pipes, which latter converge and unite into a single pipe, E'. At the point of junction of the two pipes E, leading to the exhaust-chambers of the engines on opposite sides of the locomotive, is arranged the funnel-shaped or otherwise enlarged end *p* of a pipe, P, Figs. 2, 3, 8, and 9, which pipe P is connected to an injector, hereinafter to be described.

It will be observed that the funnel-shaped or otherwise enlarged end *p* of the pipe P takes up nearly the entire space of the pipe E' at the point of junction of the two pipes E, so that the major portion of the exhaust-steam will pass into said pipe P to the injector, leaving, however, sufficient space for exhaust-steam to pass into the stack B' to produce the necessary draft.

The mouth *p* of the pipe P is held in proper position by a set-bolt, *p'*, Figs. 2 and 8, the junction of the two pipes forming a guide or directing-cone, *e*, as shown in said Figs. 2 and 8, thus directing the bulk of the exhaust-steam into the mouth of the pipe P.

In front of the boiler is arranged the feed-water heater H, which is a multitubular boiler, whose tubes *h* may correspond in number and location to those of the boiler and form substantially a continuation of said boiler-tubes.

The feed-water heater H may have any suitable form, and need not necessarily have as many tubes as the boiler, the dimensions of the heater depending in a great measure on the capacity of the boiler, and in existing locomotives on the capacity of the smoke-box.

A pipe, C, leading from the bottom of the

feed-water heater and communicating with the water-space thereof, is extended under the locomotive, and is connected with the water-space of the tender T, said pipe being provided
5 with a stop-cock, *c*, by means of which communication may be established between said pipe and the tender and the feed-water injectors I through the medium of a branch pipe, *i*, as shown in Fig. 1.

10 To one end of the feed-water heater, and communicating with the water-space thereof, is connected a branch pipe, *d*, that connects the return-pipe D with said feed-water heater in rear of an injector-casing, *i'*, in which is arranged an injector, I', Figs. 1, 2, 5, 6, and 7.
15 The injector is connected with the exhaust-steam pipe P, and is provided with a stop-cock, I², under the control of the engineer through the medium of the operating-rod R,
20 that extends to the cab of the locomotive.

The pipe D and rod R are supported by standards *d'*, secured to the platform of the locomotive, as shown in Fig. 1.

The return-pipe D is provided with a stop-cock, D', within reach of the engineer, by opening which and the stop-cock *c* a circulation of water is established from the tender to the feed-water heater through pipe C, and from said feed-water heater back to the tender
30 through branch *d* and return-pipe D.

If it is desired to accelerate the circulation of the feed-water to and from the tender and add an increment of heat, the stop-cock I² is opened to admit exhaust-steam to the injector
35 I', thereby increasing the velocity of the flow of water in the circulating-pipes and utilizing the heat of the exhaust-steam to increase the temperature of said water, said steam being condensed as it commingles with the feed-
40 water.

It is well known that the feed-injectors do not work properly when the temperature of the feed-water exceeds 65° Celsius, and in order to utilize the feed-water when heated above
45 65° Celsius independently of the injectors I have provided feed-pumps F, that are connected with the pipe D, or with the tender by pipes *f*, a suitable valve, F', being provided for each pump, said valves being controlled by
50 the engineer through the medium of rods R', a lever, L', connected with the valve-stem, and suitable articulated connecting-rods, *r r'*, connecting the levers L' with the rods R'; and *f'* are the exhaust-pipes of the pumps.

55 The pumps F are worked from the cut-off eccentrics by suitable connecting-rods, R², connected with the pump-plungers, as shown in Fig. 4.

If it is desired to feed water to the boiler at
60 normally-lower temperatures than those it is capable of acquiring when the exhaust-steam is used, the injector I' is dispensed with and the exhaust-steam pipe inclosed in the return-pipe D, the heated water being either pumped
65 directly from pipe D into the boiler or fed thereto by the usual injectors.

The exhaust-steam pipe P and the pipe D

are connected by a branch pipe, *p'*, provided with a stop-cock, so as to admit of the exhaust-steam being passed into the water in pipe D
70 to further heat the same, as shown in Figs. 10 and 11.

In order that the engineer may ascertain the temperature of the feed-water, the tender is provided with a thermometer, which I have
75 deemed unnecessary to show in the drawings, try-cocks being also provided for purposes well understood.

I claim—

1. The combination, with a locomotive-
80 boiler, of a feed-water heater, a pipe connecting the heater with the tender, a return-pipe for returning the water from the heater to the tender, and a steam-injector interposed in the return-pipe, for the purpose of accelerating
85 the circulation of the water, substantially as and for the purposes specified.

2. The combination, with a locomotive-
boiler, of a feed-water heater, a pipe connecting the heater with the tender, a return-pipe
90 for returning the water from the heater to the tender, an injector interposed in the return-pipe, and a pipe connecting the injector with the exhaust-pipe of the locomotive for the purpose of utilizing the exhaust-steam for ac-
95 celerating the circulation of the feed-water, and for further heating the same, substantially as described.

3. The combination, with a locomotive, of a feed-water heater arranged in the smoke-box
100 of the locomotive, exhaust-pipes extending from the engine along said heater and uniting into one pipe above the same, and a pipe projecting into the enlarged space formed at the junction of the two pipes, said pipe having a
105 bell-shaped or enlarged mouth occupying nearly the whole of said space, a pipe for conducting the water from the tender to the heater, a pipe for returning said water from the heater to the tender, and an injector connected
110 with the return-pipe and with the bell-mouthed exhaust-steam-collecting pipe, substantially as and for the purposes specified.

4. The combination, with a locomotive, of a feed-water heater arranged in the smoke-box
115 of the locomotive, exhaust-pipes extending from the engines along said heater and uniting into one pipe above the same, and a pipe projecting into the enlarged space formed at the junction of the two pipes, said pipe hav-
120 ing a bell-shaped or enlarged mouth occupying nearly the whole of said space, a pipe for conducting the water from the tender to the heater, a pipe for returning said water from the heater to the tender, an injector con-
125 nected with the return-pipe and with the bell-mouthed exhaust-steam-collecting pipe, a valve interposed between the injector and exhaust-steam pipe, and a valve-rod connected with said valve and extending to the engineer's cab, sub-
130 stantially as and for the purposes specified.

5. The combination, with a locomotive and a feed-water heater arranged in the smoke-box thereof and adapted to be heated by the waste

gases and products of combustion, of a pipe for conducting the feed-water from the tender to the heater, a pipe for returning the water from the heater to the tender, feed-injectors
5 for injecting the water into the boiler, and feed-pumps connected with the tender or return-pipe and operated from the cut-off eccentric crank-shaft, substantially as and for the purposes specified.

10 6. The combination, with a locomotive-boiler and a feed-water heater arranged in the smoke-box thereof and adapted to be heated by the waste gases and products of combustion, of a pipe for conducting the water from the
15 tender to the heater, a pipe for returning the water from the heater to the tender, and a pipe contained within the return-pipe connected with the exhaust-steam pipes, substantially as and for the purposes specified.

20 7. The combination, with a locomotive-

boiler and a feed-water heater arranged in the smoke-box thereof and adapted to be heated by the waste gases and products of combustion, of a pipe for conducting the water from the tender to the heater, a pipe for returning
25 the water from the heater to the tender, a pipe contained within the return-pipe connected with the exhaust-steam pipes, and a valved connection between said pipes and feed-pumps connected with the return-pipe, substantially
30 as and for the purposes specified.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 28th day of December, 1887.

LEON SELIGMANN.

Witnesses:

M. DANZIGER,
L. CHIZES.