

No. 759,660.

PATENTED MAY 10, 1904.

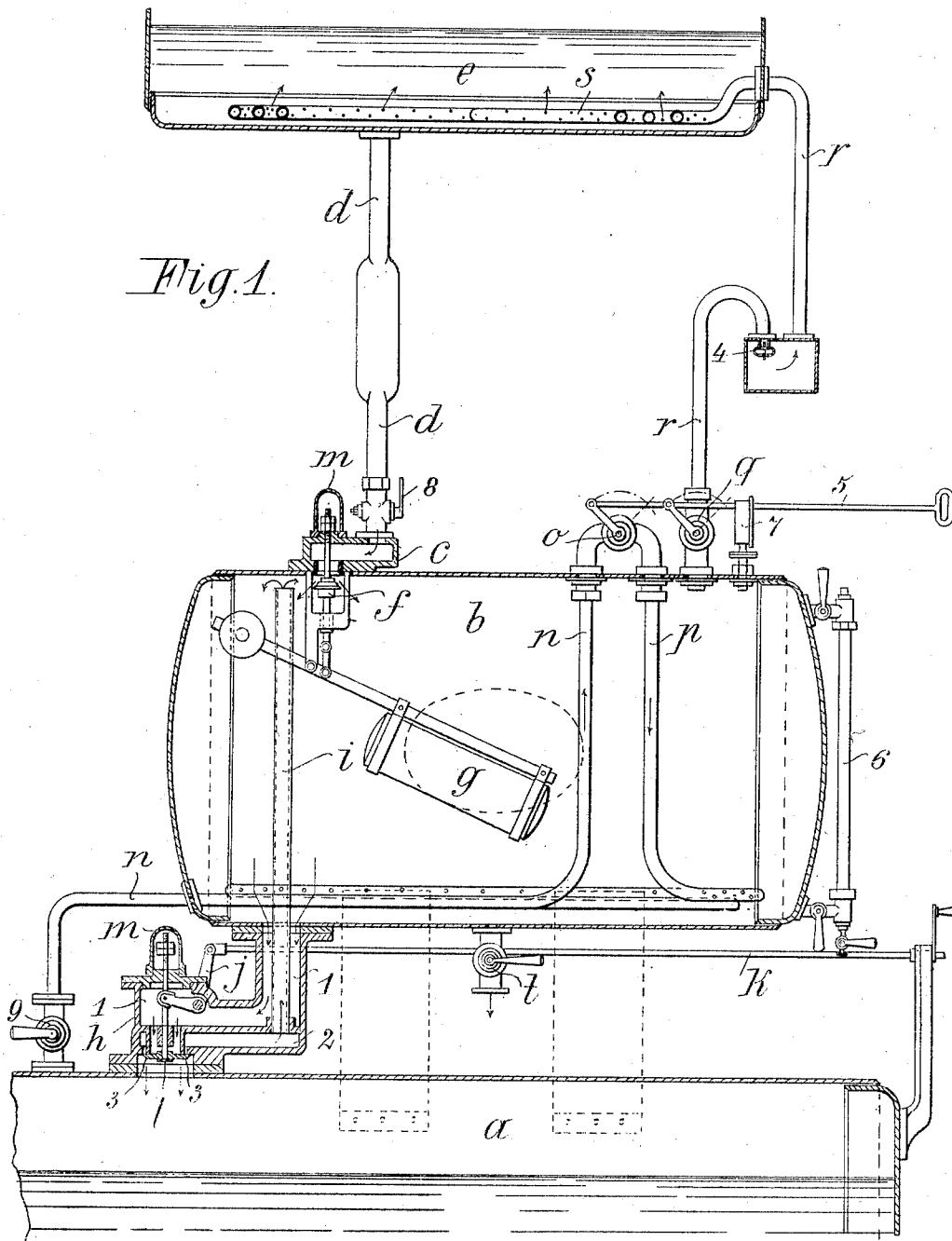
T. BRÁZDA.

APPARATUS FOR FEEDING WATER TO STEAM BOILERS.

APPLICATION FILED NOV. 21, 1903.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:
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C. S. Kesler.

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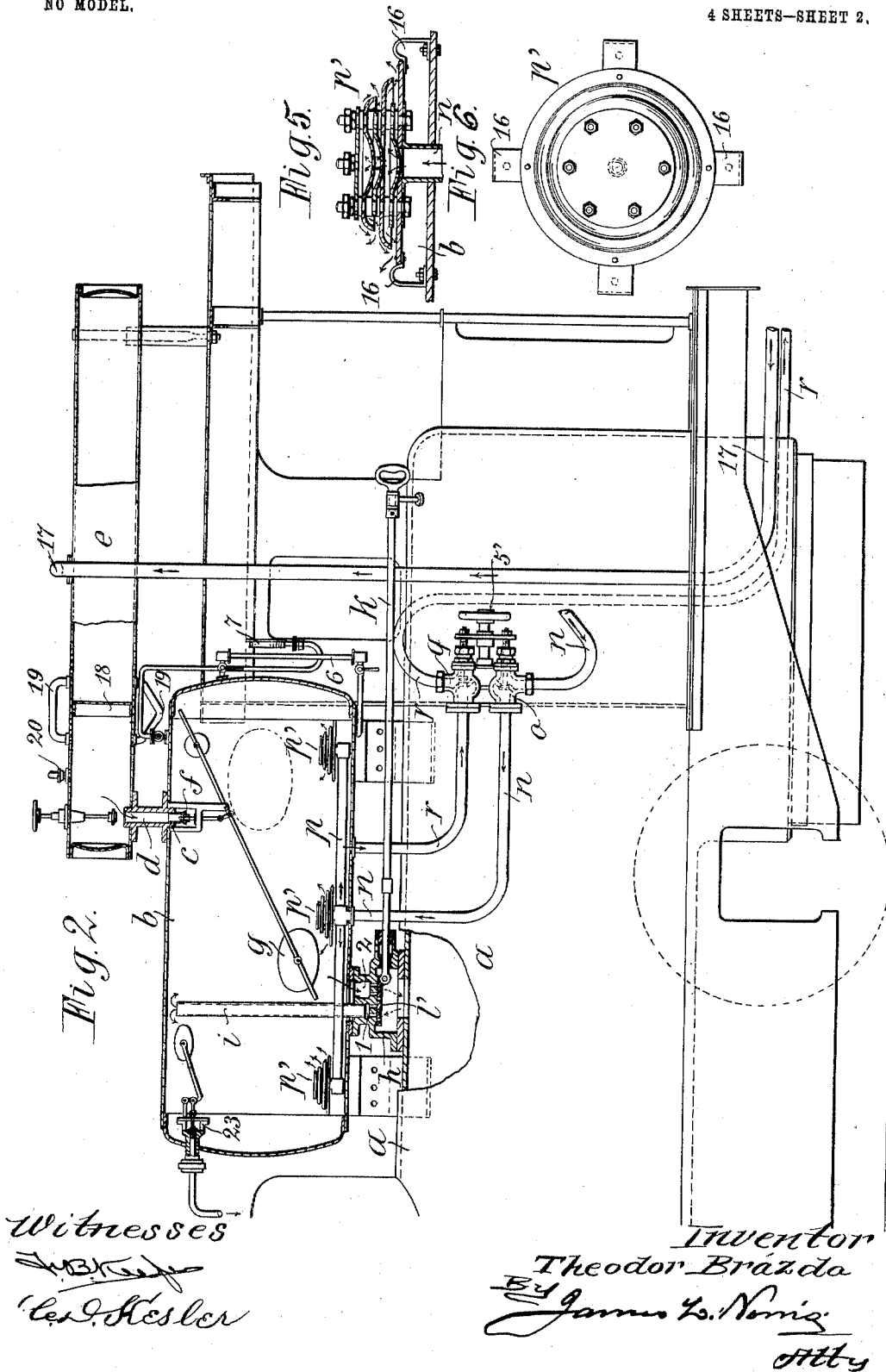
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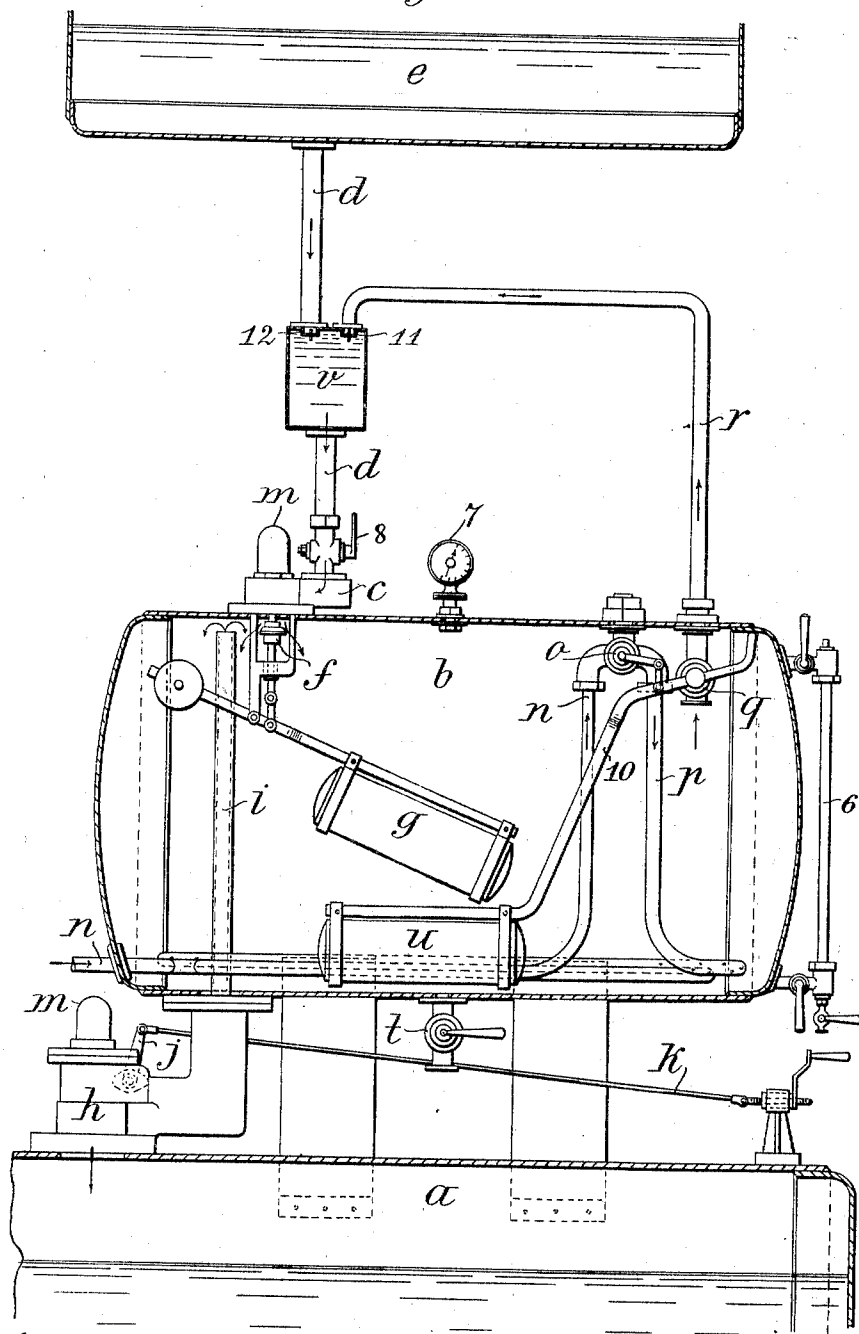
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4 SHEETS—SHEET 3.

Fig. 3.



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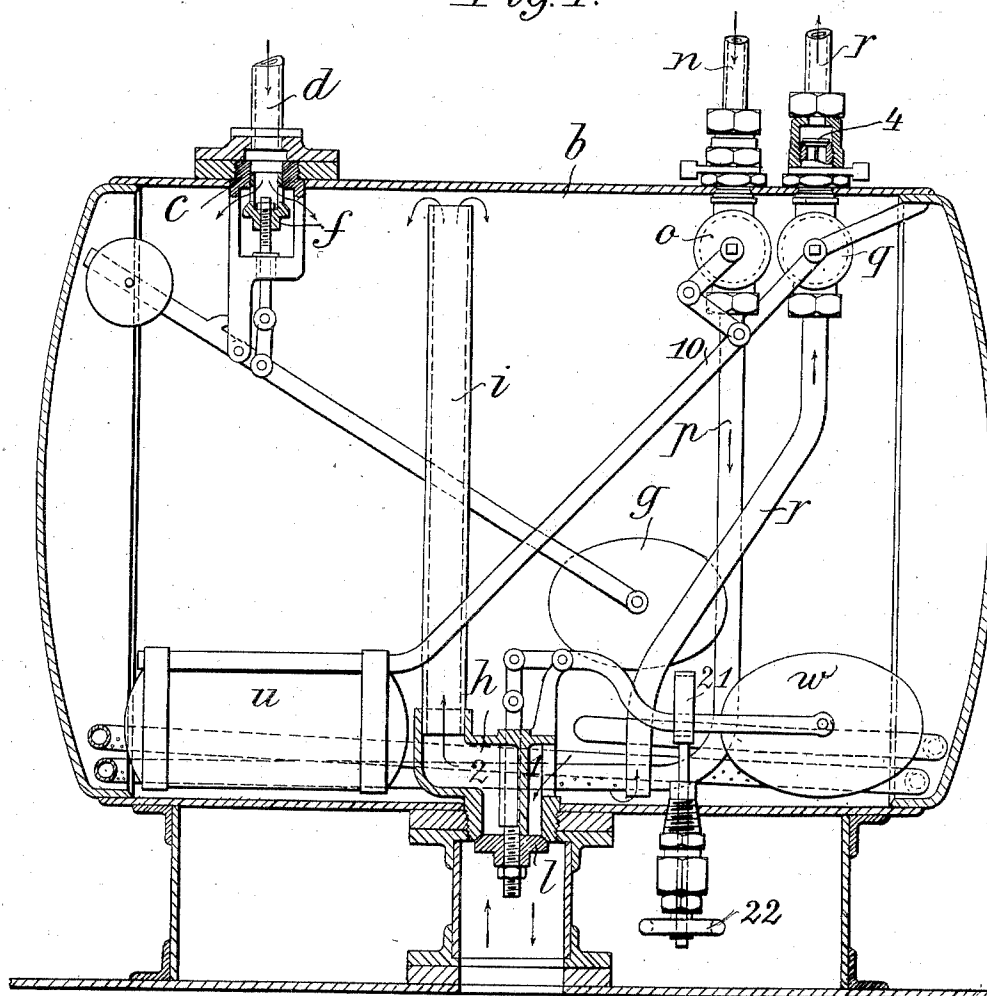
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4 SHEETS—SHEET 4.

Fig. 4.



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THEODOR BRÁZDA, OF AMSTETTEN, AUSTRIA-HUNGARY.

APPARATUS FOR FEEDING WATER TO STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 759,660, dated May 10, 1904.

Application filed November 21, 1903. Serial No. 182,181. (No model.)

To all whom it may concern:

Be it known that I, THEODOR BRÁZDA, a subject of the Emperor of Austria-Hungary, residing at Amstetten, Austria-Hungary, have invented certain new and useful Improvements in Apparatus for Feeding Water to Steam-Boilers, of which the following is a specification.

This invention relates to apparatus for supplying steam-boilers with water heated to steam temperature.

An apparatus according to this invention comprises a vessel hereinafter called the "feed-heater," situated outside of the steam-boiler and capable of being placed in communication with the boiler and with the feed-water-storage vessel. The feed-water is heated in this vessel by means of the boiler-steam. This heated feed-water when equalization of pressure is effected between the feed-heater and the boiler flows by its own weight without shock into the boiler, while steam passes at the same time from the boiler into the space above the level of the water in the feed-heater, and thereby maintains the equality of pressure in the feed-heater. This operation may be effected either by operating the feed apparatus by hand or in a partially or wholly automatic manner. After the water has flowed out of the feed-heater the steam present in the feed-heater is discharged and fresh water flows in, and thereby produces a vacuum in the feed-heater, with the result that water is sucked in from the storage vessel and the feed-heater is filled again. As the feed-water is heated outside of the boiler and enters the boiler at the same temperature as that of the water contained in the boiler, not only is the carrying over of water prevented when steam is drawn off, but also no leaking of tubes can take place in consequence of the cooling of the boiler-scale formed therein, because the deposition of boiler-scale takes place outside of the boiler.

The accompanying drawings illustrate a number of examples of construction of boiler-feed apparatus according to this invention.

Figure 1 is a vertical section of a boiler-feed apparatus which is provided with a heating-coil and in which the outflow of feed-water and the admission of steam are effected by

means of a common valve for the purpose of equalizing the pressures. This valve, like the steam-heating valve and the pressure-reducing valve, is adapted to be adjustable by hand. Fig. 2 illustrates a modification of the kind shown in Fig. 1, but with dish-shaped feed-heating devices and also with arrangements which are suitable for the use of the feed apparatus in the case of locomotives. Fig. 3 illustrates a feed apparatus of the kind shown in Fig. 1, designed for partial automatic working, but in which the steam-heating and pressure-reducing valve is regulated automatically by means of a float. Fig. 4 illustrates a construction designed for wholly automatic working. Figs. 5 and 6 illustrate a dish-shaped feed-heating device in vertical section and in plan, respectively.

In the construction shown in Fig. 1 the feed-heater *b* is arranged over the steam-boiler *a* in the usual manner, and its valve-casing *c* is connected, by means of the pipe *d*, with the feed-water-storage vessel *e*, the valve *f* being operated by means of a float *g*. Between the feed-heater *b* and the steam-boiler *a* there is arranged a valve-casing *h*, the water-space 1 of which can be connected directly with the feed-heater *b*, while its steam-space 2 can be connected indirectly, by means of a pipe *i*, with the feed-heater *b* or with the steam-space of the steam-boiler *a*. The passage for the feed-water and the inlet-aperture 3 for the steam can be closed by means of a valve *l*, which is operated by means of levers *j* and rodding *k*. A pipe *n* leads from the boiler *a* into the feed-heater *b*, wherein it is constructed as a heating-coil. This pipe is connected, by means of a cock *o*, situated outside the feed-heater *b*, with a pipe *p*, which is formed as a perforated heating-coil. For the purpose of reducing the pressure the feed-heater *b* is fitted with a pressure-reducing valve or cock *q* in a pipe *r*, which is fitted with a check-valve 4 and which ends in a heating-coil *s*, arranged in the feed-water-storage vessel *e*. The cocks *o* and *q* are adapted to be operated together by means of rodding 5 in such a manner that when cock *q* is opened cock *o* will be shut, and vice versa.

In starting the apparatus its parts are in the

positions shown. The valve f of the feed-water pipe and the pressure-reducing valve q are open, while the valve l and the cock o of the steam-heating device are shut. The flow of the feed-water into the feed-heater b will continue until the valve f is closed by the rising of the float g . When the water in the feed-heater b has risen to such a height as to cover the heating-coils of the pipes n and p , which is indicated by the water-gage 6, the cock 9 is opened and the cocks o and q are reversed by pulling the rodding 5. By this means the cock q is closed and the cock o is opened, and steam now flows from the holes in the perforated heating-coil for the purpose of heating the feed-water. When the pressure-gage 7 on the feed-heater b and the pressure-gage on the steam-boiler indicate equal pressures—that is to say, when an equalization of pressure is effected—the valve l is opened, whereas it cannot be opened so long as the pressure is higher in the steam-boiler. Now since the steam passes without hindrance through the apertures 3 and the pipe i into the feed-heater b , wherein it produces an equalization of pressure according to the amount of water that has flowed away, the feed-water now flows through the valve-passage, which is separate from the passage for the steam, without shock or noise into the steam-boiler. The valve f , on which the steam acts with the pressure obtaining in the boiler, remains closed, so that so long as the feed-water is flowing into the boiler no water can flow in from the storage vessel e . When the flow of feed-water into the boiler has ceased, which is indicated by the water-gage 6, the valve l is closed, whereupon the cocks o and q are reversed. By this means the heating-steam is shut off and the steam escapes through the cock q and the pipe r . A rapid reduction of pressure now takes place in the feed-heater b , with the result that the valve f opens and feed-water flows in from the vessel e . This inflowing water quickly condenses the steam which is still contained in the feed-heater b and also in part the steam which is passing off through the feed-water pipe d , so that a vacuum is formed in the feed-heater b , the filling of which proceeds without hindrance and without shock until the valve f is closed by the rising of the float. The feed apparatus can now be set ready for the next feeding operation, as hereinbefore described.

t is a mud-cock, and 8 is a stop-cock.

In the construction illustrated in Fig. 2 the boiler-feed apparatus is shown fitted to a locomotive. The obturating part of the valve h of Fig. 1 is shown in Fig. 2 as a slide l' . The pipes n and r lead to the double valve o , the valve-plugs of which can be opened and closed together by means of a hand-wheel 5'. The pipe r leads from the valve-casing to the water-space of the tender for the purpose of heating the water contained therein, and the pipe n of the heating-duct leads to a steam-

valve in the cab of the locomotive. From Fig. 2 it may also be seen that in this boiler-feed apparatus the heating of the feed-water may be effected by means of dish-shaped feed-heating devices p' , which are connected to the steam-pipe p , instead of by a heating coil. These dish-shaped feed-heating devices consist of flat and dish-shaped disks, Figs. 5 and 6, connected together by means of stay-bolts and of which the lowest is connected to the steam-inlet pipe n , while the other disks, with the exception of the top disk, are formed with central apertures. The steam flowing in through the pipe n is distributed radially by the flat disks and is deflected by the curved portions of the dish-shaped disks and is then thrown back so that the steam flows with a whirling motion through the water in the feed-heater, and thus gives up its heat to the feed-water. For the purpose of deadening the noise caused by the flow of the steam through the feed-heating devices they may be attached to the vessel h by means of springs 16, so as to be capable of oscillating. The storage vessel e is preferably arranged over the roof of the cab of the locomotive and is connected by a pipe 17 with the water-space of the tender, so that when a vacuum is formed the feed-water can be sucked into the vessel e . By omitting the vessel e and connecting the pipe 17 to the feed-heater b the water may be sucked directly into the latter. In order to be able to prevent a delay in the forming of the vacuum by the inflow of too-highly-heated water from the vessel e into the feed-heater b , a partition 18 is fitted in the vessel e , and communication is established, by means of pipes 19, between the two chambers thus formed, so that the heating of the water affects only the smaller chamber, which is provided with a pressure-reducing valve 20. Two feed apparatus of the kind described may be arranged on the boiler, so that the filling and heating of the feed-water may be taking place in one apparatus while the other apparatus is in use for feeding the boiler.

The construction shown in Fig. 3, arranged for semi-automatic working, differs from that which has just been described in that the cock o of the heating-pipe and the pressure-reducing cock q are arranged in the feed-heater b and are reversed together by means of a float u , arranged on levers 10, in such a manner that as soon as the water in the feed-heater covers the heating-pipes p and n the cock o is opened and the cock q is gradually closed. The construction shown in Fig. 3 shows, further, that the steam-draw-off pipe r can open into a vessel v , which is inserted in the feed-water pipe d and in which the ends of these pipes are fitted with check-valves 11 and 12, so that water is injected by pulsometer action intermittently at f for the purpose of accelerating the condensation of the steam and the formation of a vacuum in the feed-heater.

In the construction shown in Fig. 4 the valve *l* is operated by means of a float *w*, arranged in the feed-heater for the purpose of enabling the feed apparatus to act wholly automatically. So long as no equalization of pressure has taken place the valve *l* will be kept shut by the steam-pressure in the boiler *a* in opposition to the upward tendency of the float *w*. When the equalization of pressure is effected, the valve *l* is opened by the float *w*, whereupon the other operations take place in the manner hereinbefore described. The pipe *p* of the valve *o* may be connected to the dish-shaped feed-heating device *p'* in the case of semi-automatic as well as in the case of wholly automatic working, and in such a case the steam-pipe *n* is connected from the outside to the valve *o*.

In order to enable the duration of the feeding period to be lengthened or shortened at will, so that one and the same feed apparatus may be used for boilers of all sizes, the stroke or lifts of the valves are made adjustable. For this purpose either the valves *f* and *l*, Fig. 4, are screwed direct on their valve-spindles or the latter extend without stuffing-boxes through their casings, Fig. 1, and carry nuts by shifting of which the stroke is limited, the ends of the spindles being covered by caps *m* for the purpose of easy access and of a steam-tight closure, or a stop 21, capable of being adjusted from the outside by means of a hand-wheel 22, Fig. 4, is arranged to act upon the levers of the floats.

For the purpose of preventing the floats employed in connection with the valves from collapsing under high steam-pressure the floats are balanced by charging them with water to the amount of one-tenth of their capacity, so that as the feed-water becomes heated steam is also generated inside the floats at a pressure which balances the external steam-pressure. The floats of the water-admission valves are preferably partially balanced. The float *g*, which rises with the water in the vessel *b*, is adapted to close the valve *f* when the water reaches a predetermined level. There are times, however, when the water is apt to pass this level, due to the expansion of the water by heat applied thereto. In such a case as this the float *g* would be elevated beyond the desired level and might collapse. To avoid this possibility, I provide a relief-valve 23, connected with a float, which latter when the level of the water rises, due to the expansion thereof under the action of heat, opens the relief-valve to permit the surplus water to flow from the vessel *b* through an outlet controlled by said valve.

Since the feed apparatus, with its fittings, is arranged outside of the boiler, this has the advantage that the apparatus never comes in contact with the boiler-fire and that all the parts are readily accessible for the purposes of cleaning and repair.

I claim as my invention—

1. In a steam-boiler the combination of a heating vessel connected to the boiler and having two conduits, one of said conduits for admitting steam from the boiler to the heating vessel, and the other for exhausting water from the heating vessel to the boiler, a valve common to both the said conduits for controlling the flow of fluid therethrough, and means for heating the water contained in said heating vessel.

2. In a steam-boiler, the combination of a heating vessel connected to the boiler and having two conduits one of said conduits for admitting steam from the boiler to the heating vessel, the other for supplying water from the heating vessel to the boiler, a valve common to both the said conduits for controlling the flow of fluid therethrough, mechanism for controlling the supply of water to said vessel, and means for heating the water in said heating vessel.

3. In a steam-boiler, the combination of a heating vessel connected to the boiler and including two passages, one of said passages for admitting steam to the heating vessel and the other for discharging water to the boiler, a valve common to both of said passages for controlling the flow of fluid therethrough, and mechanism for controlling the supply of water to said heating vessel.

4. In a steam-boiler, the combination of a heating vessel and a storage vessel each in communication with the other, valves for controlling said communication, means for actuating each of the said valves, said heating vessel communicating with the boiler by two passages, one of said passages for admitting steam to the heating vessel and the other for discharging water to the boiler, a valve for controlling both of said passages and means for heating the water contained in said heating vessel.

5. In a steam-boiler, the combination of a heating vessel and a storage vessel each in communication with the other, valves for controlling said communication, means for actuating each of the said valves, said heating vessel communicating with the boiler by two passages, one of said passages for admitting steam to the heating vessel and the other for discharging water to the boiler, a valve for controlling both of said passages, mechanism for controlling the supply of water to said heating vessel, and means for heating the water in said heating vessel.

6. In a steam-boiler, the combination of a heating vessel having means for establishing communication between the vessel and boiler comprising two openings one of said openings for admitting steam to the heating vessel and the other for supplying water to the boiler, a valve for controlling said openings, means for actuating the valve, a water-supply vessel in communication with the heating vessel, a valve

for said communication, automatic means for controlling said valve, a heating-pipe connected to the boiler and the heating vessel, a heating-pipe leading from the heating vessel to the water-supply vessel, and valves having mechanism for cutting off the supply of heat in one of said pipes while the other remains open.

7. In a steam-boiler, the combination of a heating vessel communicating with the boiler and provided with two passages one of said passages for admitting steam to the heating vessel and the other for discharging water therefrom to the boiler, a valve for controlling the said passages, means for actuating the

valve, a storage vessel, a supply-pipe connecting the same with the heating vessel, a float-controlled valve for said supply-pipe to automatically control the supply therefrom, heating-pipes within said vessel, and valves for each of said pipes, one of said pipes connected to the boiler and the other to the heating vessel.

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

THEODOR BRÁZDA.

Witnesses:

JOSEF RUBASCH,

ALVESTO S. HOGUE.