(No Model.) 2 Sheets—Sheet 1.

N. CLUTE.

APPARATUS FOR FEEDING BOILERS.

No. 512,682. Patented Jan. 16, 1894.

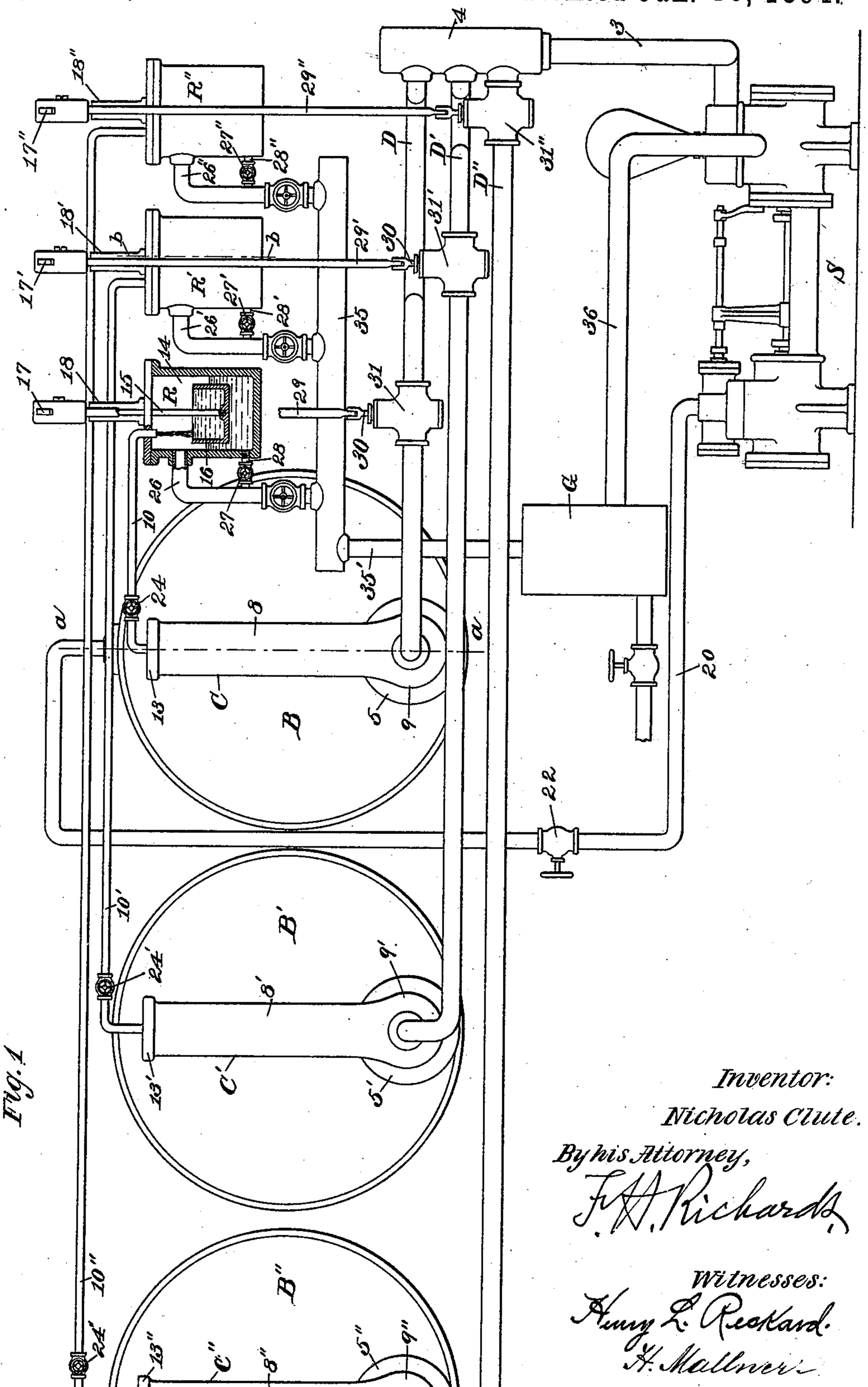

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

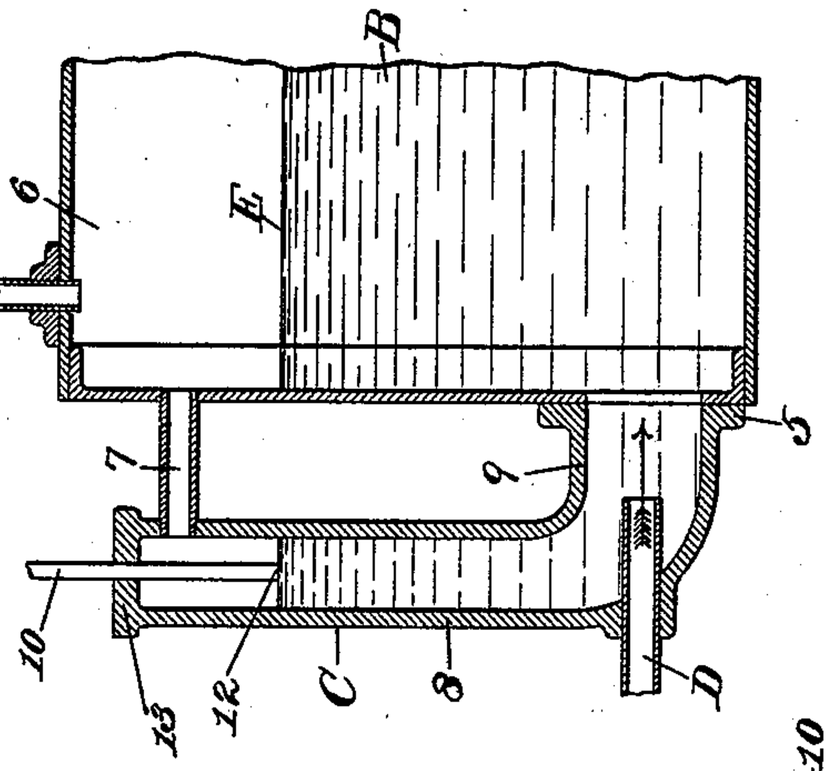


Fig. 5

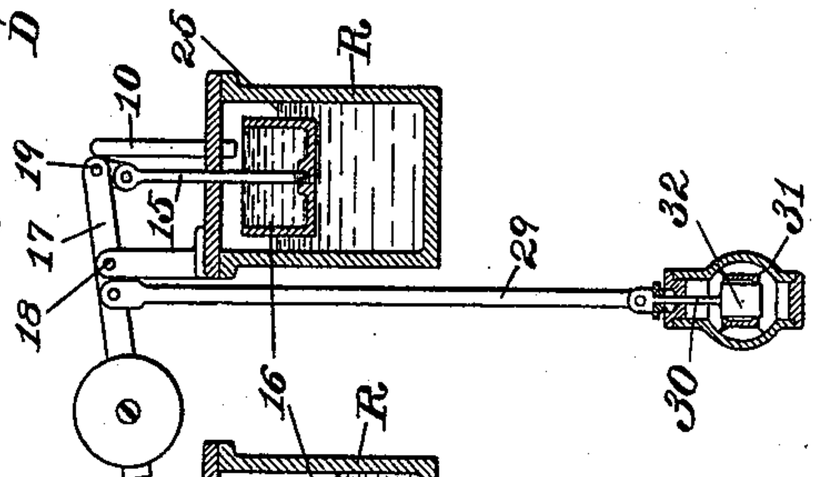


Fig. 4

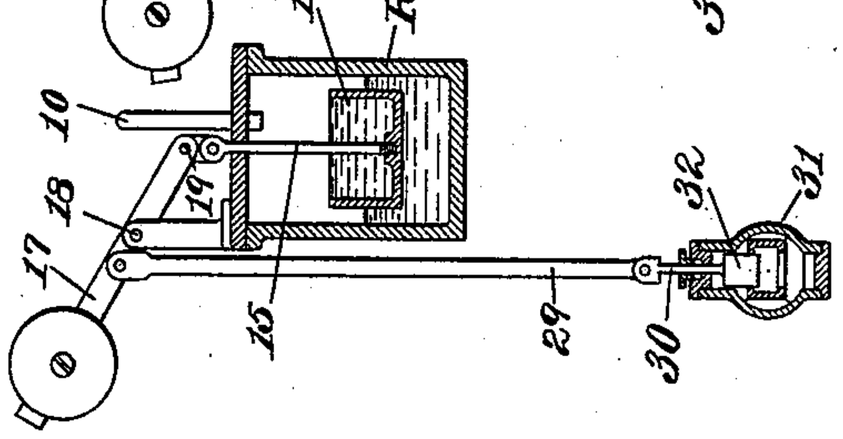
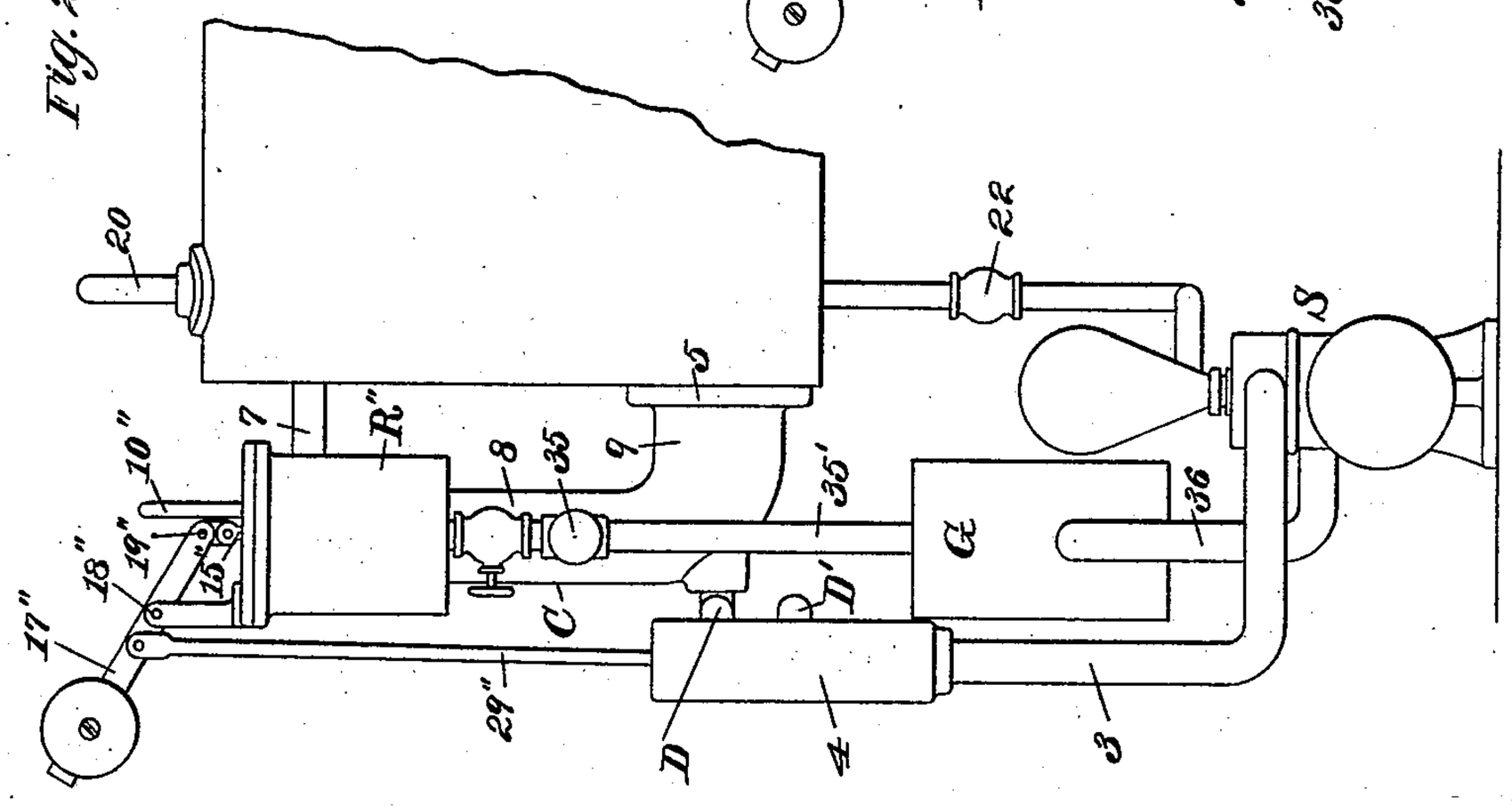


Fig. 2



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UNITED STATES PATENT OFFICE.

NICHOLAS CLUTE, OF SCHENECTADY, NEW YORK.

APPARATUS FOR FEEDING BOILERS.

SPECIFICATION forming part of Letters Patent No. 512,682, dated January 16, 1894.

Application filed May 21, 1891. Serial No. 393,649. (No model.)

To all whom it may concern:

Be it known that I, NICHOLAS CLUTE, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Apparatus for Feeding Boilers, of which the following is a specification.

This invention relates to improvements in apparatus for feeding boilers, and also to apparatus for feeding a series of "batteries" of boilers; the object of the invention being to provide a simple and effective apparatus for the regulated pumping of the feed-water to each boiler of the series from the same pump, the regulating of the pumping being effected by means of improved regulator apparatus.

In the drawings accompanying and forming a part of this specification, Figure 1 is a front elevation of a plant embodying my present improvements. Fig. 2 is an elevation of the apparatus as seen from the right-hand in Fig. 1. Fig. 3 is a sectional view in line *a a*, Fig. 1. Figs. 4 and 5 are similar sectional views, in line *b b*, Fig. 1, illustrative of the construction and mode of operation of the regulator apparatus.

My present invention is in part in the nature of an improvement on the "method of feeding boilers" described and claimed in my prior application, Serial No. 366,489, filed September 29, 1890; the regular apparatus is in part an improvement on the boiler-feeding apparatus described and claimed in Letters Patent of the United States No. 404,683, granted to me June 4, 1889.

According to my present improvements, the series of boilers or steam-generators to be supplied are each connected by an independent pipe with the delivery-pipe of the pump, and each boiler-feeding pipe is furnished with a regulator-valve actuated from an independent regulator supplied from the same boiler to which the said pipe leads. In the drawings, a series of three boilers are shown, and a corresponding series of three regulators, these being ranged side by side and connected by drainage pipes with the several boilers respectively.

The feed-pump S is or may be of the kind usually employed for feeding boilers, and as shown in the drawings is supposed to be a direct-action steam-pump whose steam cylinder, (at the left-hand in Fig. 1,) is supplied through the pipe 20 leading from one of the boilers. In this pipe a suitable stop-valve, as 22, is provided for stopping and starting the pump. The water-cylinder of the pump (which is at the right-hand in Fig. 1) is connected by a pipe, 3, with the head or chamber 4, from which the several pump-supplying pipes, D, D′, and D″, lead to the boilers B, B′, and B″, respectively.

One feature of my present improvements relates to the manner of connecting the boiler-supplying pipes with the boilers. The details for making said improved connection being the same for each boiler, a description of one of them will suffice as a description of all of them, it being observed that the several parts of the boiler B′ are designated by characters with the addition of the "prime" mark, and the corresponding parts on the boiler B″ by characters having the "second" mark.

A stand-pipe, C, having a horizontal part which should be of larger diameter than the vertical portion of the stand-pipe, is connected by a suitable flange, as 5, or otherwise, to the side or end of the boiler B at a considerable distance below the water-line E, as shown in the sectional view, Fig. 3. The upper end of the stand-pipe extends above the water-line, and is connected with the steam-space 6 of the boiler through a steam-pipe 7. By means of the permanent steam and water connecting passages 7 and 9, respectively, the water level in the stand-pipe is naturally maintained at the same height as the water level in the boiler.

The boiler-supplying pipe D is connected to the stand-pipe at the lower end thereof, and should be in substantial alignment, as indicated in the drawings, with the horizontal connecting portion 9 of said stand-pipe. The said supply-pipe D should also enter some distance into the stand-pipe, for the purpose of avoiding the slight tendency of the water to suddenly rise or fall in the stand-pipe when the influx of water is increased or diminished. For the same reason also, the horizontal part 9 of the stand-pipe is preferably made considerably larger in diameter than the vertical part 8 of said pipe. The operation of this part of my improvement is to keep the stand-pipe supplied with fresh water which has not entered the boiler, thereby effectually pre-

venting any of the floating impurities in the boiler from entering into the stand-pipe.

The drainage-pipe 10 is connected to the stand-pipe, with its inner end 12 at the normal water level. Heretofore, as shown in my aforesaid application for Letters Patent, the drainage-pipe employed has entered the boiler horizontally thereof at the water-line. This arrangement, however, is considered somewhat objectionable, since it is more likely in that case to become accidentally clogged by impurities floating on the surface of the water. As one means toward overcoming that objection, I now introduce the drainage-pipe 10 through the cover 13 of the stand-pipe, substantially as shown in the drawings, thus bringing the inner end of said pipe to the water level with the end of the pipe terminating in a horizontal plane. By this means any impurities floating on the top of the water and which naturally collect around the outer edge of the water surface, are less apt to enter the drainage-pipe.

Another important advantage of the foregoing features is that the over-supply of feed-water is drained from the stand-pipe at the same temperature substantially as it had when entering into said pipe, thus avoiding the over-heating of the drainage-water by subjecting it to the higher temperature of the steam-making water; it being well understood that the highest temperature of the feed-water is about 212°, while the temperature of the water in the boilers at a pressure, for instance, of eighty pounds per square inch, is nearly 330°. In practice, the feed-water is being delivered into the stand-pipe nearly or quite all the time, although in varying quantities. But even a slight supply is sufficient to maintain a constant current in the horizontal arm 9 of the stand-pipe and thus prevent any material heating of the water in the stand-pipe above the feed-water temperature.

The regulators of the boilers or steam-generators B, B′, and B″ are designated in a general way by R, R′, and R″, respectively. The regulators may occupy any convenient position relatively to the other parts of the steam plant; but I prefer, as a matter of convenience, to locate them side by side at one side of the battery of boilers, substantially in the manner illustrated in the drawings. The regulator consists of the vented chamber 14, having a cover through which the rod or piston 15 of the float 16 passes. The float is or may be counterpoised by means of a weighted lever, 17, pivotally supported by a bracket at 18 and connected at 19 to the upper end of said float-piston. The float is a hollow bucket, usually of cast-iron, and is rigidly secured to the lower end of the said rod 15. The drainage-pipe from the stand-pipe of the boiler, (or from the boiler at the water-line thereof, when no stand-pipe is used,) enters the regulator-chamber over said bucket, so that the drainage-water, after passing the drainage-controlling valve 24 in the drainage-pipe, passes along said pipe to the regulator-chamber and falls into the regulator-bucket, as indicated by the descending stream of water in the regulator R, Fig. 1. When the said regulator bucket-float is filled or weighted with water, this overflows and supports the float, as indicated at 25 in the regulator R, Fig. 5. The regulator-chamber has two outlets, one being the vent at the bottom thereof, and one from the top thereof, designated by 26 and 28, respectively. In the lower outlet pipe there is a vent-regulating valve, 27, for graduating the discharge of the accumulated drainage-water from the regulator-chamber. The valves 24 and 27 are to be adjusted so as to normally discharge the drainage-water from the regulator-chamber more slowly than it enters said chamber, thus providing for the raising of the float by the continued entrance of the drainage-water into the regulator. The upper outlet 26 is the over-flow for the discharge from the regulator-chamber of the surplus of drainage-water while the float remains lifted. When the water level in the stand-pipe is lowered below the orifice of the drainage-pipe 10, steam instead of water passes through said pipe and is discharged from the chamber through said overflow; in the meantime the accumulation of drainage-water is discharged through the vent-pipe 26, thus lowering the float.

For regulating the boiler supply from the regulator R, the regulator-lever 17 is connected through a suitable rod, 29, with the stem 30 of the regulator-valve 31 in the boiler-supplying pipe D. Said regulating valve 31 may be of any suitable description, but I prefer to use for said purpose one of the well-known balanced valves, as shown, now sometimes used as "throttle valves." This class of valves being well known, a particular description thereof is deemed unnecessary. Said valve, in a well-known form thereof, is shown in section in Figs. 4 and 5, wherein the usual balanced plunger or valve-disk is designated by 32, being shown open in Fig. 4, and closed in Fig. 5. The drainage-water passing from the several regulators R, R′, and R″, is delivered through suitable pipes, as for instance the pipes 35 and 35′ to the pump-supplying pipe 36, (and through the feed-water heater G, when such device is used,) whence it passes into the boiler supply and is thus utilized without any loss of the heat therein.

The regulator-valve, it will be observed, is placed in the feed-pipe D intermediate to the steam-generator and the self-acting feed-pump, so as to control the operation of said pump through the resistance offered by the valve to the passage of the feed-water through said pipe to the generator B. The regulator-valve being controlled automatically from the variable accumulation in the regulator of the over-supply of feed-water drained from the generator, automatically regulates the speed of the pump by varying as required the aforesaid resistance. This feature being ap-

plied to each of the feed-pipes of the series of generators B, B′, B″, has the effect of limiting the feed-supply to the aggregate supply required by the whole series of generators. In practice, it generally happens that the steaming is somewhat irregular in the different boilers or generators of a series, so that at nearly all times some one generator will require a larger feed-supply than the others of the series. My present improvements fully provide for that requirement, and have also the advantage of moderating the operation of the pump to secure the most uniform speed thereof, thereby providing for the most regular and uniform operation of the heating apparatus, G, which usually supplies hot feed-water to the pump and receives the discharge from the regulators. The heater G may be of any well-known description, but I prefer to use therefor the improved feed-water heater using exhaust-steam and described in my prior application, Serial No. 383,953, filed March 6, 1891.

By the term "steam-generator" is to be understood any suitable and well-known form of steam boiler or generator, together with the stand-pipe or chamber communicating with said boiler or generator, when such a stand-pipe or chamber is employed. It is evident that the employment of a stand-pipe or chamber intermediate to the feed-water supply and the boiler is immaterial to some of the features of my present invention.

Having thus described my invention, I claim—

1. The combination with the boiler, of the feed-water supply and the regulator-valve therefor, and a water-actuated regulator operatively-connected with the regulator-valve, said regulator being supplied through a pipe leading from said feed-water supply intermediate to the valve and boiler, whereby the feeding of the boiler is regulated by the relatively cool feed-water drained from the boiler-supply before this enters the boiler, substantially as described.

2. The combination with the boiler, of the stand-pipe having water and steam connections with the boiler, the feed-pipe entering the stand-pipe and having a valve, a water-actuated regulator operatively-connected with said valve, and a drainage-pipe leading from the stand-pipe to the regulator, whereby the regulator is operated by fresh feed-water, substantially as described.

3. The combination with the boiler, of the stand-pipe having water and steam connections substantially as described with the boiler, the feed-pipe entering the stand-pipe and set to deliver the in-flowing stream of feed-water into said water-connection, and means regulating the supply of feed-water substantially as described, whereby the stand-pipe is supplied by fresh feed-water unmixed with the sediment of the boiler, substantially as as described.

4. The combination with the boiler, of the stand-pipe having the enlarged water connection at its lower end, and the steam connection at its upper end, the feed-pipe entering the stand-pipe in alignment with the water connection, the water-actuated regulator, in connection therewith, for automatically regulating the feed supply, and a drain-pipe entering the stand-pipe vertically at its upper end and in communication with and supplying the regulator, substantially as and for the purpose described.

5. The combination with the boiler, of the stand-pipe having water and steam connections with the boiler, substantially as described, a feed-pipe entering the stand-pipe in alignment with the water connection, a regulator valve in said feed-pipe, a water-actuated valve-regulator in connection with, and operating said valve, and a drain-pipe communicating with the upper end of the stand-pipe and with the regulator, substantially as and for the purpose described.

6. The combination with a multiplicity of boilers, of a water feeding apparatus, comprising a steam-actuated boiler-feeding pump, the steam supply-pipe therefor in communication with a boiler, a common supply-pipe or chamber connected therewith, a stand-pipe for each boiler having a water and a steam connection, as described, a series of feed-pipes in communication with the common supply-pipe, each of which is provided with a regulating-valve, and is connected at its opposite end with one of the stand-pipes in alignment with the water connection, a series of water-actuated regulators, having valves, actuating mechanism in connection with the valves of the feed-pipes, a series of drain-pipes, each one of which is connected at one end to one of the stand-pipes, is in communication with the regulator at the other end, and supplies water to said regulator, and over-flow pipes for the regulators communicating with the water end of the pump, whereby the over-flow is returned to the water end of the pump whence it is again discharged through the system of feed-pipes, substantially as and for the purpose described.

7. In boiler-feeding apparatus, the combination with the boiler, and with the steam-actuated boiler-feeding pump having the pump-delivery-regulating valve, of the regulator having a continuously-open discharge-outlet of less capacity than the inlet thereto, and connected at its inlet with the boiler at the water-line thereof, the float in the regulator, and valve-actuating connections connecting the float with said regulating valve and constructed to close said valve on the rising of the float, substantially as described.

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