

No. 810,996.

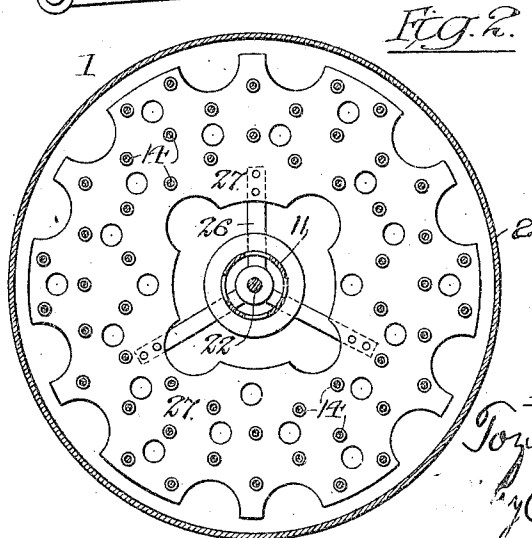
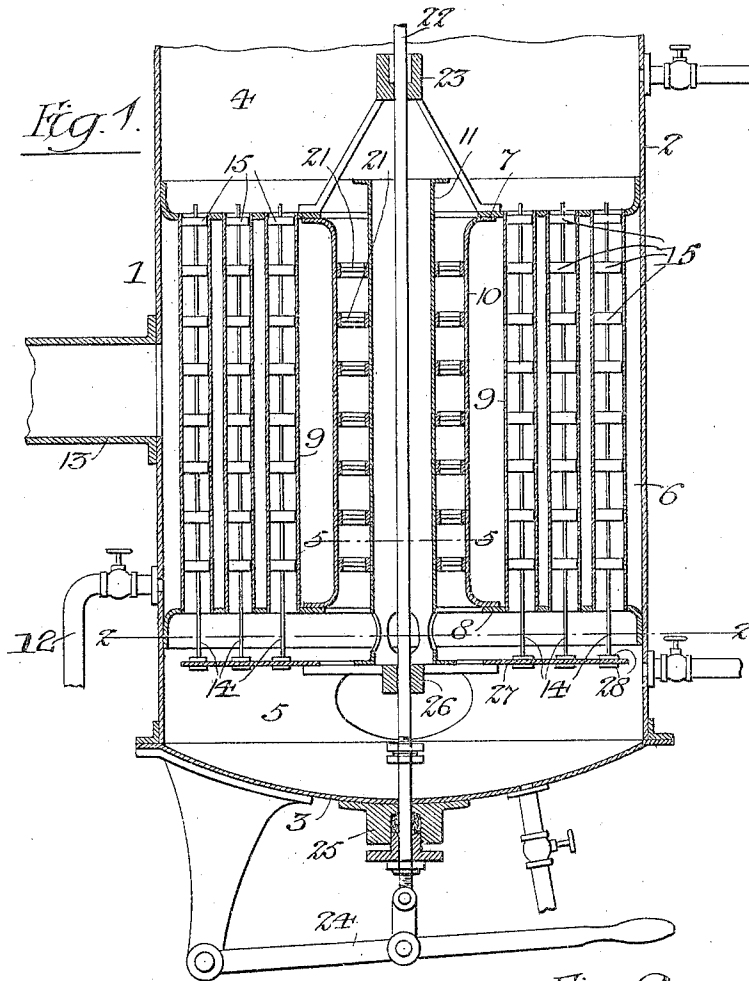
PATENTED JAN. 30, 1906.

T. SUZUKI.

FLUE SCRAPER FOR EVAPORATORS, BOILERS, AND THE LIKE.

APPLICATION FILED JUNE 12, 1905.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 6.

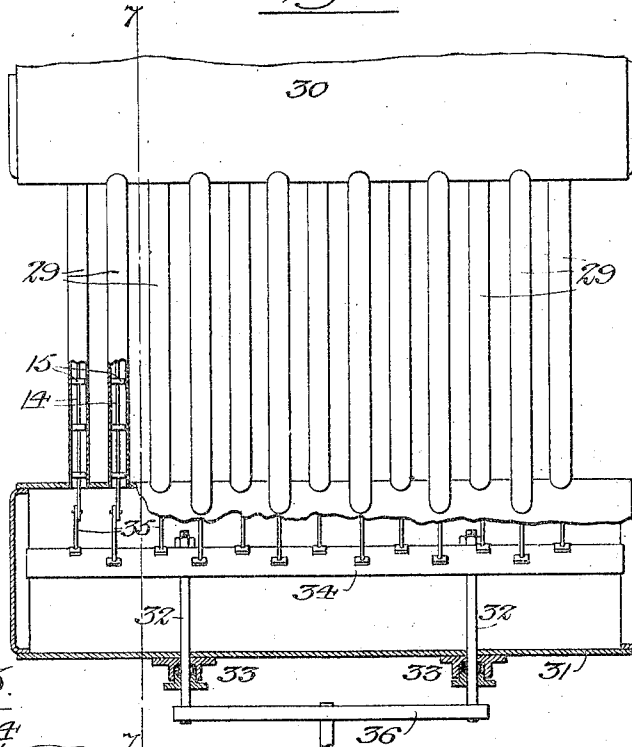


Fig. 3.

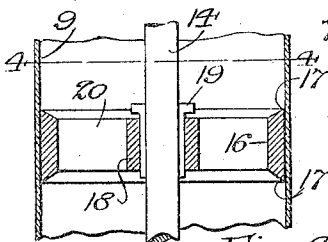


Fig. 4.

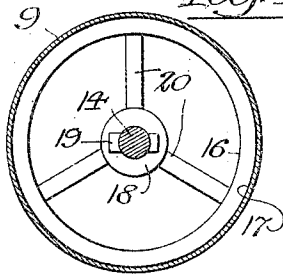


Fig. 7.

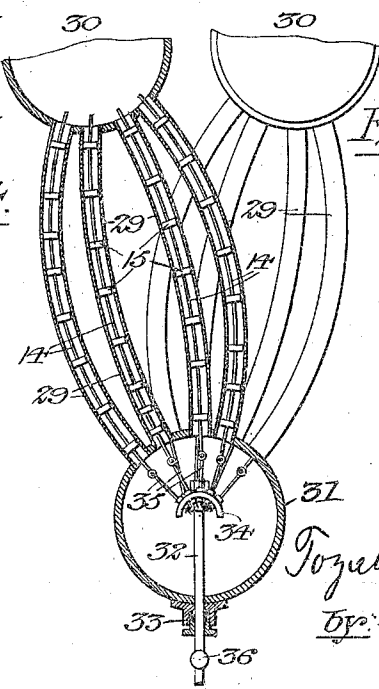
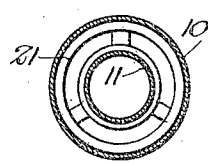


Fig. 5.



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UNITED STATES PATENT OFFICE.

TOZABURO SUZUKI, OF SUNAMURA, JAPAN.

FLUE-SCRAPER FOR EVAPORATORS, BOILERS, AND THE LIKE.

No. 810,996.

Specification of Letters Patent.

Patented Jan. 30, 1906.

Application filed June 12, 1905. Serial No. 264,825.

To all whom it may concern:

Be it known that I, TOZABURO SUZUKI, of No. 401 Jibeishinden, Sunamura, in the county of Minami-Katsushika, in the Province of Tokyo, Empire of Japan, have invented certain new and useful Improvements in Flue-Scrapers for Evaporators, Boilers, and the Like, of which the following is a full, clear, and exact description.

My invention relates to improvements in flue-scrapers for evaporators, boilers, and the like, and has for its principal object the provision of a scraper which may be operated to effectively scrape the flues of the evaporator while the same is in operation.

My invention consists in the provision of a plurality of rods adapted for permanent location within the flues which are provided with a plurality of scrapers, each of the rods being connected with a single actuating-rod, which may be operated from the exterior of the evaporator.

Heretofore in removing incrustation, scale, and like non-heat-conducting substances which deposit on the flues it has been necessary to shut down the particular evaporator to be cleaned. Where the flues are infrequently cleaned, the efficiency of the evaporator is not only reduced by the accumulation of scale, but damage often results from burning of the flues. Even when the flues are frequently cleaned the evaporator cannot operate in the most efficient manner, as the accumulation of scale deposits prior to cleaning is always considerable. Therefore only the highest efficiency is obtained subsequent to the cleaning operation. These defects are entirely obviated by the application of my improved device, since the flues may during the operation of the evaporator be cleaned as often as desired, maintaining the flues entirely free from scale deposits, thereby securing maximum efficiency at all times. Furthermore, the losses entailed during periods of time necessary for the cleaning operation are altogether avoided.

My invention will be more fully described in connection with the accompanying drawings and will be more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view in vertical section of an evaporator, showing the application thereto of my improved flue-scraper. Fig. 2 is a horizontal sectional view on line 2 2 of Fig. 1. Fig. 3 is a detail sectional view of a portion of one of the flues, showing in

cross-section a scraper and its rod. Fig. 4 is a horizontal sectional view on line 4 4 of Fig. 3. Fig. 5 is a horizontal sectional view on line 5 5 of Fig. 1. Fig. 6 is a view in side elevation, with parts broken away, showing my improved scraper applied to a tubular boiler wherein the tubes are curved or irregular in shape. Fig. 7 is a sectional view on line 7 7 of Fig. 6.

Like parts are designated by similar characters of reference throughout the different figures of the drawings.

My invention as herein shown is applied to an evaporator and is utilized for removing the scale and incrustation which deposits on the inner walls of the water-tubes. It will, however, be obvious that the device of my invention will be applicable to a boiler wherein the scrapers are located in the combustion-flues to remove soot deposits and like accumulations.

Referring to Figs. 1 to 5, inclusive, there is shown an evaporator 1, having a cylindrical wall 2 and a bottom wall 3. The evaporator is divided into upper and lower vapor and liquid chambers 4 and 5 and an intermediate combustion-chamber 6 by means of diaphragms 7 and 8. Communication is effected between the chambers 4 and 5 by means of tubes 9, which are closed to the combustion-chamber 6 and extend vertically therethrough. A central and relatively enlarged tube 10 is employed which is provided with an inner or double circulating-tube 11. The steam or other heating agency passes through the combustion-chamber 6 by means of an inlet 12 and an outlet 13, playing upon the tubes 9 and 10 to heat the liquid therein.

I will next refer specifically to my improved scraper and the manner in which it is applied to the evaporator. As shown, each of the tubes 9 is provided with a scraper-rod 14, which extends substantially throughout the length of the same and a short distance below the lower diaphragm 8. Each of said rods is provided with a plurality of scrapers 15, which are spaced apart throughout the length of the tubes to engage the walls thereof to permit the same to be scraped by a limited reciprocating movement. As shown, the rods are in an extreme upper position with the topmost scrapers 15 adjacent the upper ends of the tubes 9. The lower scrapers in this position of the rods are located a distance above the lower ends of the tube equal to the spacing of the scrapers. Thus when

the rods 14 are thrown downwardly a sufficient distance to bring the lowermost scraper 15 adjacent the lower end of the tubes 9, each of the remaining scrapers will have scraped the tube throughout a distance equal to the spacing of the scrapers and each scraper will when the rod is in a lowermost position occupy a position in the tube formerly occupied by its downwardly-preceding scraper. Thus it will be seen that in a single and relatively short downward reciprocation of the rods 14 each of the tubes will be scraped throughout their entire length. Each of the scrapers is preferably constructed as follows, referring to Figs. 3 and 4: As shown, there is provided an annular ring 16, provided with sharp cutting margins 17, adapted for engagement with the walls of the tubes 9. The said scrapers desirably fit snugly within the tubes, and as the rods 14 are reciprocated the sharp edges 17 engage the scale and incrustation, cutting the same and causing it to descend to the lower wall of the evaporator. The outer annular rings 16 are connected to the rods 14 by means of hubs 18 and keys 19. Said hubs and rings are connected by means of spokes 20. It will be seen that the openings between the spokes 20 permit free passage of the contents of the tubes 9. It will also be obvious that when it is desirable the annular rings 16 may be replaced by other forms of scraping devices. In the form of evaporators shown in Fig. 1, where a double circulating-tube 11 is employed, I desirably clean the tube 10 by means of scrapers 21, rigidly secured to the tube 11. Said scrapers 21 are desirably spaced apart substantially the same as the scrapers 15 in a manner to clean the entire inner wall of the tube 10 by a single reciprocation. The tube 11 is loosely mounted in a manner to reciprocate in unison with the rods 14, so that the entire cleaning operation of the tubes 9 and 10 may be effected in one operation. To this end I desirably provide a main actuating-rod 22, which, as shown, is mounted in an upper bearing 23 and projects downwardly throughout the length of the evaporator and through the lower wall 3 thereof, where it is connected with a lever 24. A packing box or gland 25 is provided in the lower wall 3, through which the rod 22 projects. As shown, there is provided a spider 26, secured to the rod 22, which directly supports the tube 11. The arms of the spider 26 project outwardly beyond the tube 11, where they are rigidly secured to a perforated plate 27. The rods 14 of the various tubes 9 are rigidly secured to the plate 27, as shown, by means of nuts 28. By reference to Fig. 2 it will be seen that the plate 27 is provided with a plurality of perforations, so that resistance to the water and the lower chamber 5 during reciprocation of the scrapers will be reduced to a minimum.

I will next refer to the application of my invention as shown in Figs. 6 and 7, which is therein made to a tubular boiler wherein the water-tubes 29 are connected with upper and lower drums 30 and 31, wherein the tubes are curved or irregular in form. In this form the rods 14, carrying the scrapers 15, are flexible, so that they will readily conform to the curvature of the tubes. The main actuating rod or rods 32, projecting through glands 33 in this form of the device, extend upwardly in the drums 31 and are connected by a longitudinally-curved strip 34. The rods 14 are jointly connected with rods 35, which are rigidly secured to the strip 34. Each of the rods 32 is connected by a rod 36, as shown in Fig. 6, so that all of the rods 14 and their respective scrapers may be actuated in unison.

The device of my invention is applicable to any kind of evaporator or boiler and affords a ready and effective means for cleaning the tube or flues without shutting down or in any way interfering with the continued operation of the evaporator.

While I have herein shown and described specific embodiments of my invention, I do not wish to be limited thereto, as it will be obvious that changes may readily be made in the structures shown without departing from the spirit of the invention.

Therefore what I claim, and desire to secure by Letters Patent, is—

1. A scraper for evaporators, boilers and the like provided with a plurality of flues, a rod for each of the flues extending throughout the length thereof, a plurality of scrapers for each rod spaced apart in a manner to scrape the flue throughout its length by a limited reciprocation, and a main actuating-rod extending through the wall of the evaporator and connected with each of said rods whereby the same may be reciprocated in unison.

2. A scraper for evaporators, boilers and the like provided with a plurality of flues, a rod for each of the flues, a plurality of scrapers for each rod, each scraper comprising an annular ring provided with sharp margins, a hub keyed to the rod and spokes connecting the hub and ring, and a main actuating-rod extending through the wall of the evaporator and connected with each of said rods whereby the same may be reciprocated in unison.

3. A scraper for evaporators, boilers and the like provided with a plurality of flues, a rod for each of the flues extending throughout the length thereof, a plurality of scrapers for each rod spaced apart in a manner to scrape the flues throughout their length by a limited reciprocation, each scraper comprising an annular ring provided with sharp margins, a hub keyed to the rod, spokes connecting the hub and ring, and a main actuating-rod extending through the wall of the evaporator and connected with each of the rods

whereby the same may be reciprocated in unison.

4. A scraper for evaporators, boilers and the like provided with a plurality of curved flues, a flexible rod for each of the flues extending throughout the length thereof, a plurality of scrapers for each rod spaced apart in a manner to scrape the flue throughout its length by a limited reciprocation, a main actuating-rod extending through the wall of the evaporator and jointedly connected with each of said rods whereby the same may be reciprocated in unison.

5. A scraper for evaporators, boilers and the like provided with a plurality of curved flues, a flexible rod for each of the flues, a plurality of scrapers for each rod each scraper comprising an annular ring provided with sharp margins, a hub keyed to the rod, spokes connecting the hub and ring, and a main actuating-rod extending through the wall of the evaporator and jointedly connected with each of said rods whereby the same may be reciprocated in unison.

6. A scraper for evaporators, boilers and the like provided with a plurality of curved flues, a flexible rod for each of the flues extending throughout the length thereof, a plurality of scrapers for each rod spaced apart in a manner to scrape the flue throughout its length by a limited reciprocation, each scraper

comprising an annular ring provided with sharp margins, a hub keyed to the rod, spokes connecting the hub and ring, and a main actuating-rod extending through the wall of the evaporator and jointedly connected with each of the rods whereby the same may be reciprocated in unison.

7. A scraper for evaporators, boilers and the like comprising a rod and a plurality of scrapers equally spaced apart along and being in close contact with the flue whereby movement of said rod equal to the spacing between any two scrapers serves to bring the scrapers in contact with the flue throughout its length.

8. A scraper for evaporators, boilers and the like comprising a rod, and a plurality of scrapers having oppositely-disposed cutting edges, said scrapers being equally spaced apart along and being in close contact with the flue whereby movement of said rod in opposite directions a distance equal to the spacing of any two scrapers serves to bring said scrapers in contact with the flue throughout its length.

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

TOZABURO SUZUKI.

Witnesses:

GEORGE KURIBARA,
UKACHI ISHIWARA.