

Feb. 14, 1928.

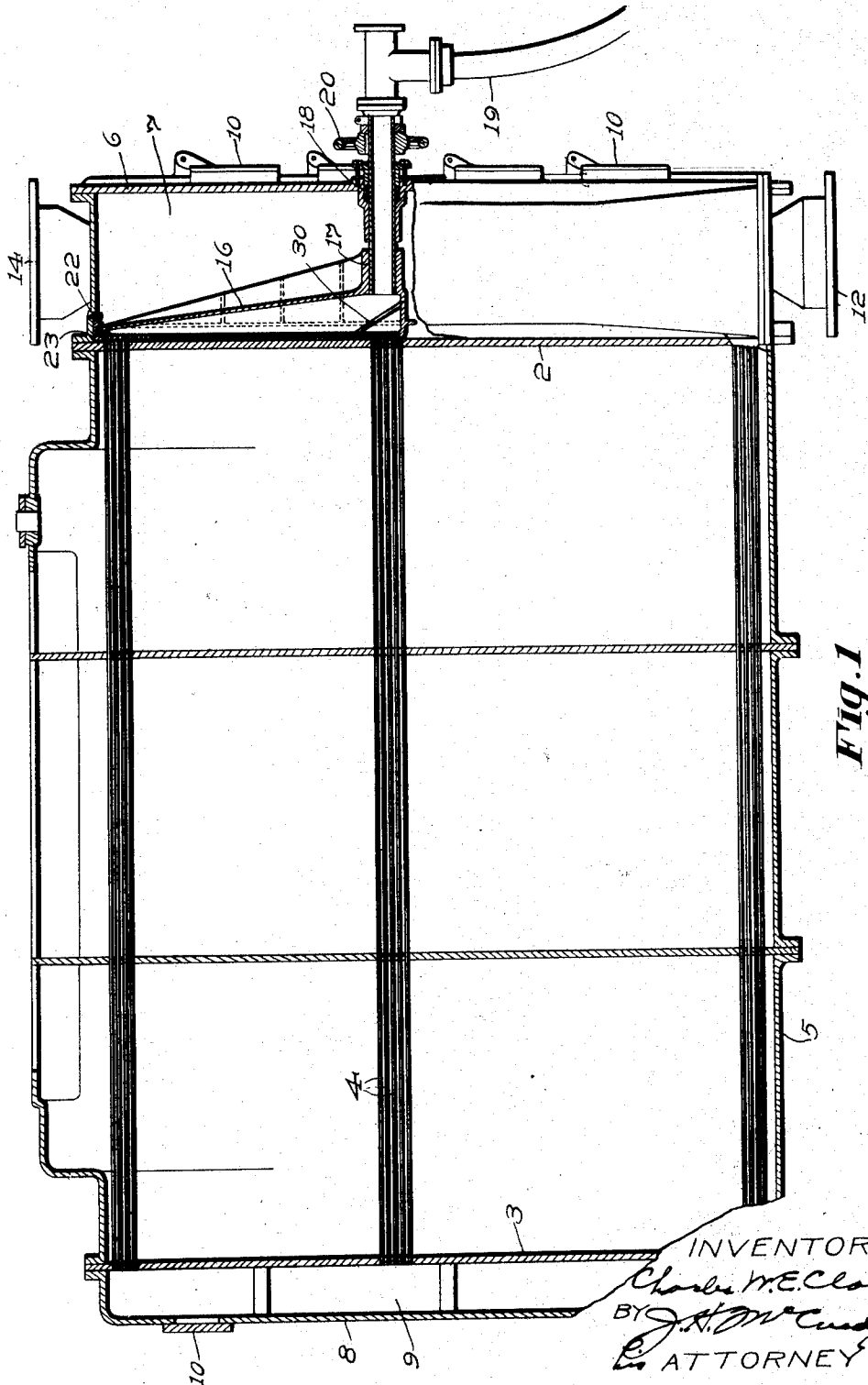
C. W. E. CLARKE

1,659,459

CONDENSER

Filed March 17, 1923

3 Sheets-Sheet 1



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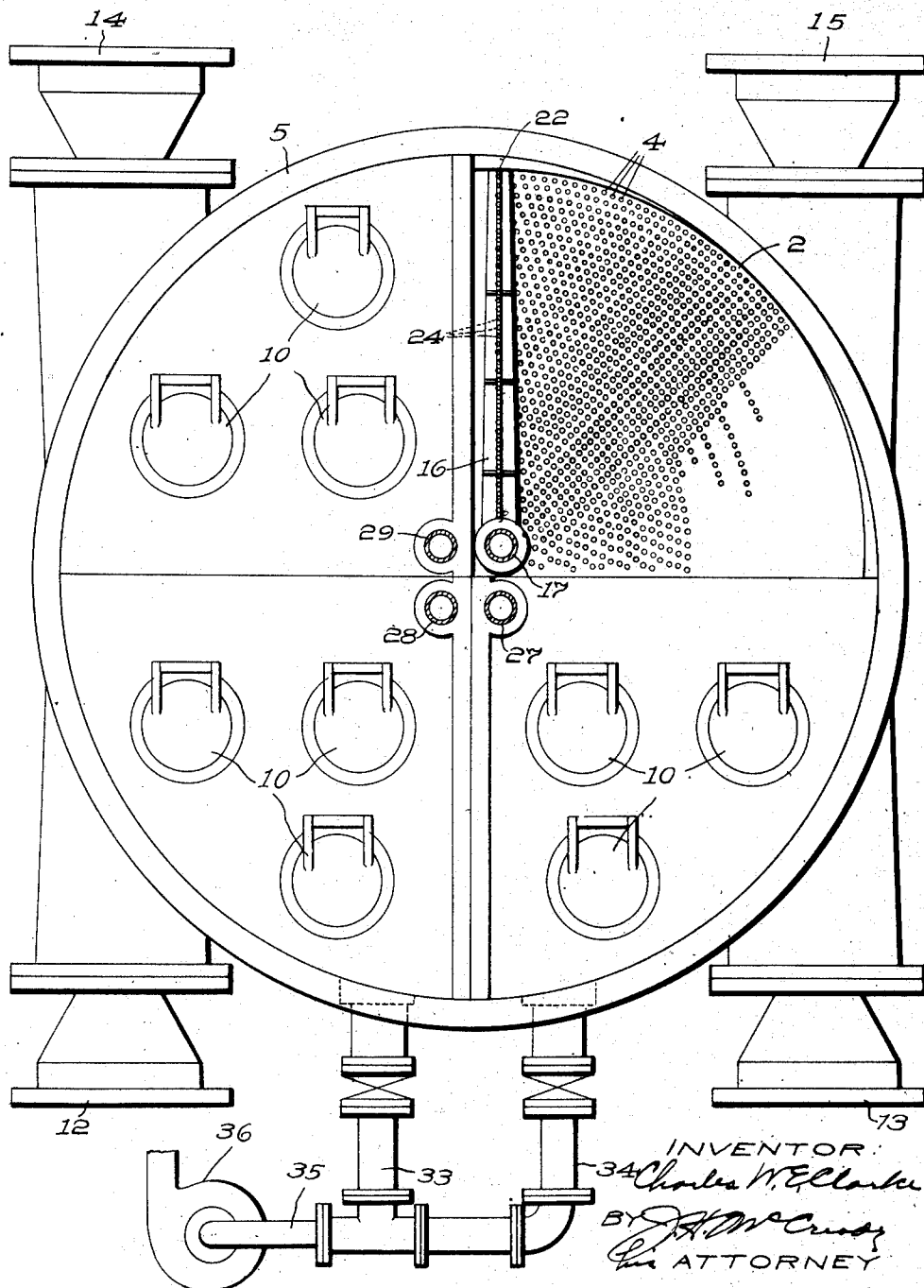
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Fig. 2



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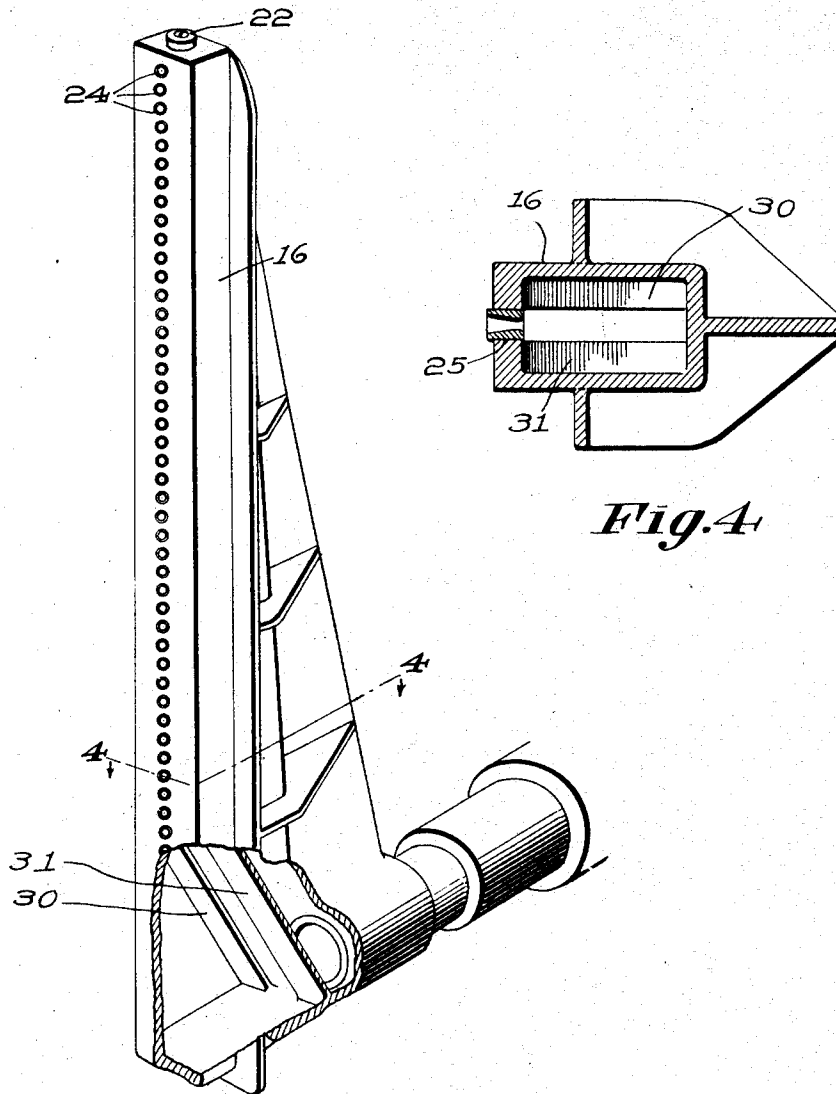


Fig. 4

Fig. 3

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CONDENSER.

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This invention relates to condensers of the surface type, and it has for its chief object to improve such condensers with a view to facilitating the cleaning operation. The invention aims to facilitate both the cleaning of the tubes and also the cleaning of the water spaces in the condenser.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a view, partly in vertical cross section, and partly in side elevation, of a condenser constructed in accordance with this invention;

Fig. 2 is a front elevation of the condenser shown in Fig. 1, a portion of the casing being broken away to show parts contained therein;

Fig. 3 is a perspective view of the spray pipe or nozzle; and

Fig. 4 is a cross sectional view on the line 4-4, Fig. 3.

The condenser shown comprises a front tube head 2, a rear tube head 3, and a series of tubes 4, only a few of which are shown in Fig. 1, supported in said heads. The tubes are enclosed in a casing 5 to which the steam to be condensed is admitted and from which the condensate is withdrawn by suitable connections. A water box head 6 is spaced from the front head 2 and cooperates with casing members to form a water space 7 at the front end of the condenser. Another head 8 at the rear of the condenser cooperates with the tube head 3 to form a water space 9 at this end of the apparatus. Access to the water spaces is afforded by the usual hand holes normally closed by covers 10. Circulating water is admitted through inlet heads 12 and 13 and is discharged through outlet heads 14 and 15, respectively, the water spaces being divided by suitable partitions adapted to create the desired circulation through the condenser.

The construction so far described is exactly like that of a well known commercial condenser. The tube lay-out and cleaning

apparatus of the condenser shown, however, differ radically from prior constructions. In the arrangement shown, the tube sheet 2 is divided into four sections or quadrants, as best shown in Fig. 2, and each section is provided with its own cleaning apparatus. This apparatus for the upper right-hand section, Fig. 2, comprises a spray pipe or nozzle 16 which consists of a hollow arm preferably welded on the inner end of a pipe 17, Fig. 1, that projects through a stuffing box 18 in the water box head 6. The latter pipe is connected at its outer end through suitable fittings and a flexible pipe 19 with a source of steam under pressure, or with any other suitable source of cleaning fluid. A hand wheel 20 is secured to the pipe 17 outside the casing to enable the operative to turn the pipe 17 and the spray pipe 16 about the axis of the pipe 17. The outer end of the spray pipe 16 is equipped with a roll 22 which travels in a track or groove formed in a part 23 secured fast to the condenser casing. These parts support and guide the outer end of the spray pipe.

Formed in the face of the spray pipe adjacent to the tube head 2 is a series of discharge openings 24, Figs. 2 and 3. These discharge openings may be simply holes of suitable shape drilled through the front wall of the pipe, but preferably they consist of nozzles, such as that indicated at 25, Fig. 4, set into this wall. The steam or other cleaning fluid which is conducted to the spray nozzle is discharged at a high velocity through the openings 24, and it is the action of these streams travelling through the tubes 4 which cleans the tubes. In condensers as heretofore constructed, a spraying device of some type has been mounted in the water box head so that it could be moved around to direct a stream through the tubes. The movement of this device, however, has been entirely under the control of the operator, the device being mounted for a more or less limited universal movement. The effectiveness of the cleaning operation, therefore, has been entirely within the care and discretion of the operator, and he has had no way of determining whether all the tubes were cleaned or not without opening the con-

denser head and making an inspection. According to the present invention, the tubes are arranged in the tube head in a definite relationship to the discharge openings in the spray pipe and this pipe is mounted for movement in a fixed path. The arrangement is such that as the spray pipe is moved across the tube head, the streams discharged therefrom must shoot directly into the tubes. The roll 22 and guide 23 support the outer end of the spray pipe against movement away from the tube head due to back pressure.

Referring more particularly to Fig. 2, it will be seen that the spray pipe 16 is mounted to swing through an angle of approximately 90° and that the tubes 4 are spaced along the arcs or paths of travel of the discharge openings 24. Each tube, therefore, is directly in the line of the stream discharged from one of said openings 24 in some position of the spray pipe. This arrangement thus completely overcomes the "hit or miss" cleaning which has characterized prior installations, since, as the pipe 16 is swung slowly over the tube head 2, the discharge openings come successively into direct register with the tube ends and each tube, consequently, must be subjected to the cleaning action of a stream of steam or other fluid discharged from one of the openings 24.

The same cleaning arrangement is provided for each of the other three sections of the condenser, the pipes corresponding to the pipe 17 being shown in Fig. 2 at 27, 28 and 29, respectively. The spray pipes are installed permanently in the condenser, as distinguished from being removable, as in the usual cleaning apparatus.

For the purpose of equalizing the pressure within the spray pipe, it is provided near its axis with deflecting ribs or baffle plates 30 and 31, Fig. 4, which direct the greater part of the incoming stream of steam upwardly into the nozzle and thus produces a more uniform flow through the various discharge openings than otherwise would be obtained.

Referring to Fig. 2, it will be seen that pipes 33 and 34 lead from the bottom of the waterbox space at opposite sides of the vertical partition therein and are connected through a pipe 35 with the intake end of a centrifugal pump 36. When the condenser is to be cleaned the valves in these pipes 33 and 34 are opened before the water inlet valve is closed. Such debris as is brought down from the head or is lying in the bottom of the waterbox space is then pumped overboard by the pump 36. This permits the pumping out of practically all the water in the waterbox space so that when the hand hole covers or doors are subsequently opened, the water will not run out on the floor and make a disagreeable mess. This arrange-

ment is further advantageous in that it permits the scraping off of the debris that accumulates on the condenser tube head, the material so removed dropping into the bottom of the waterbox where it can be flushed out and pumped overboard instead of being taken out and removed by hand. A dirty and unsatisfactory process thus is avoided while a more effective cleaning of the condenser is effected.

While I have herein shown and described the best embodiment of my invention which I have so far devised, it will be appreciated that the invention is not limited to embodiment in the particular form shown.

Having thus described my invention, what I desire to claim as new is:

1. In an apparatus of the character described, the combination of a condenser having a tube head and a series of tubes mounted in said head, said head being divided into quadrants, a spray pipe for each quadrant, and means for supporting each of said pipes for pivotal movement across the face of said tube head closely adjacent thereto and about an axis located adjacent to the center of said head, each spray pipe having a series of discharge openings in the side thereof adjacent to said head and the ends of said tubes in each quadrant being located at points spaced along the paths of movements of said discharge openings, whereby the streams discharged from said openings will be directed into the ends of said tubes as the spray pipe is moved across the tube head.

2. A spray pipe for condensers comprising a hollow arm having a series of discharge openings formed in one side thereof, a lateral inlet opening located at one end of said arm for the admission of cleaning fluid, and deflecting ribs within said arm adjacent to said opening for diverting the greater part of the incoming stream of fluid toward discharge openings located remotely from said inlet.

3. In an apparatus of the character described, the combination of a condenser having a tube head and a series of tubes mounted in said head, a spray pipe mounted for pivotal movement across the face of said tube head closely adjacent thereto, means for supporting said pipe, said spray pipe having a series of discharge openings in the side thereof adjacent to said tube head for directing streams of fluid into said tubes, and means cooperating with the outer end of said spray pipe to support it against movement away from said tube head.

4. In an apparatus of the character described, the combination of a condenser having a tube head and a series of tubes mounted in said head, said head being divided into sections, a spray pipe for each section, means for supporting each of said spray pipes for pivotal movement across the face of its re-

spective section of said tube head and closely adjacent thereto, each spray pipe consisting of a hollow arm having a series of discharge openings in the side thereof adjacent to said head and the ends of said tubes in each of said sections being located at points spaced along the arcs of movement of said discharge openings, whereby the streams discharged from said openings will be directed into the ends of said tubes as the spray pipe is swung about its pivotal axis, and means for conducting fluid under pressure to said spray pipe in the neighborhood of said axis. 10

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