(No Model.)

# G. J. NOPPER.

## OIL INJECTOR FOR STEAM BOILERS.

No. 522,532. Patented July 3, 1894.

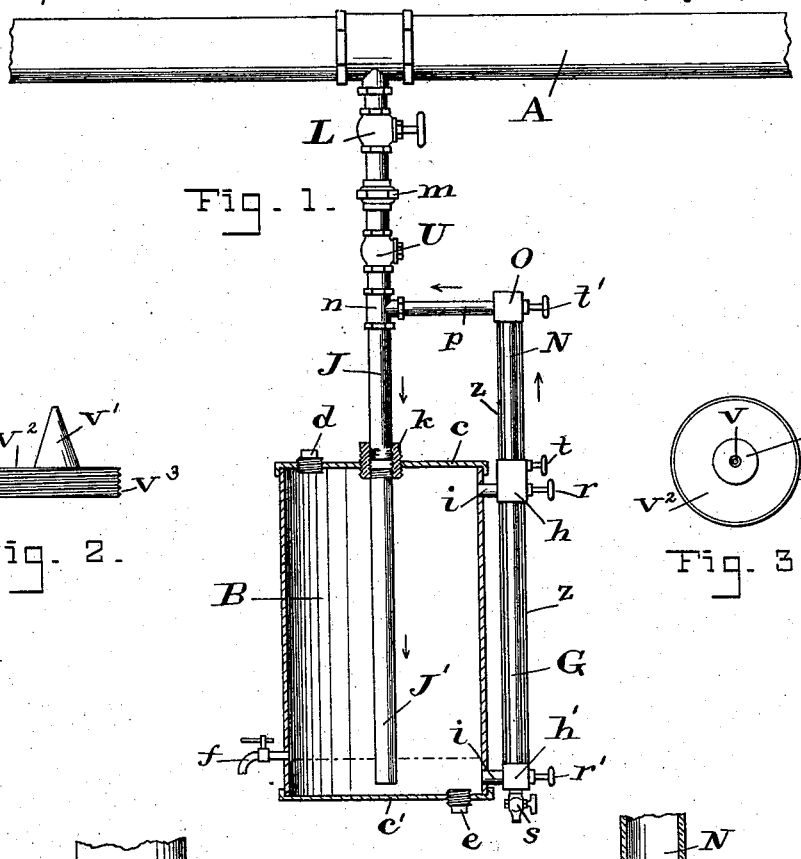


Fig. 1.




Fig. 2.




Fig. 3.

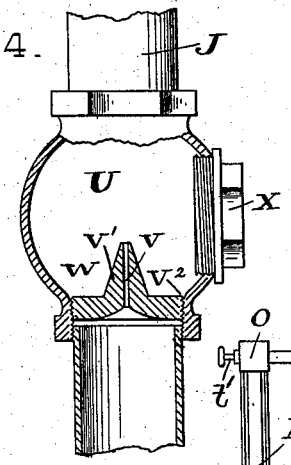


Fig. 4.

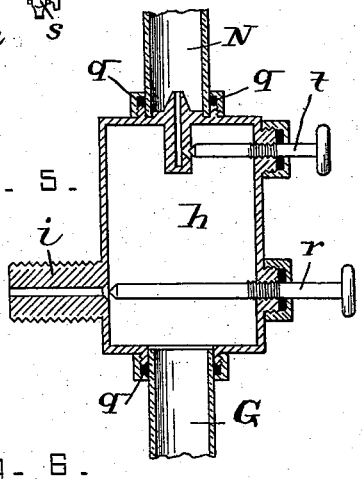


Fig. 5.

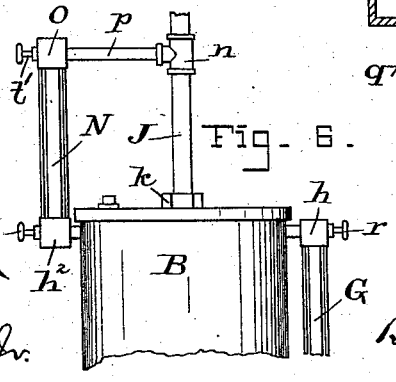


Fig. 6.

WITNESSES:

L. L. Van Horn

Chas. B. Mann Jr.

INVENTOR:

Geo. J. Nopper

By Chas. B. Mann

ATTORNEY.

# UNITED STATES PATENT OFFICE.

GEORGE J. NOPPER, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-HALF TO LEOPOLD STROUSE, OF SAME PLACE.

## OIL-INJECTOR FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 522,532, dated July 3, 1894.

Application filed April 12, 1894. Serial No. 507,222. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE J. NOPPER, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Oil-Injectors for Steam-Boilers, of which the following is a specification.

This invention relates to an apparatus for supplying oil in the form of drops to the feed-water that enters a steam boiler. The oil thus supplied in small quantities to the boiler prevents the formation of scale.

As heretofore constructed boiler oil-injector apparatus would supply oil in the form of drops only so long as the valve was set to suit a certain speed of the stroke of the piston of the water pump; but if the speed of the pump should be increased the oil-feed by regular drops would cease, and instead the feed would be by little spurts or streams of varying quantity. This manner of feed is decidedly objectionable because the engineer cannot determine how fast the oil is feeding.

It is the object of this invention to provide for a sight feed which is at all times under the eye of the engineer, and also to provide for supplying the oil in drops with a constancy that shall not be varied or affected by the pulsations of the pump.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the improved oil-injector apparatus partly in section. Figs. 2 and 3 are side and top views respectively of the restricted passage. Fig. 4 is a section view of the case containing the restricted passage. Fig. 5 is a section view of the valve-chamber to which the glass tubes are attached. Fig. 6 shows a view of the upper end of the oil-receptacle and an arrangement of glass feed-tube and glass gage-tube different from that shown in Fig. 1.

The letter, A, designates the feed-water pipe which supplies the boiler with water.

The oil-receptacle, B, is a cylinder provided with two heads, *c*, *c'*; the upper head has a plug, *d*, for filling oil into the cylinder, and the lower head a plug, *e*, for entirely emptying the cylinder. The cylinder is to contain both oil and water; the oil being of less specific gravity will be in the top and the water in the bottom. The side of the cylinder near the bottom has a draw-off cock, *f*, and a glass gage tube, G, is supported at the side by metal chambers, *h*, *h'*, each of which has nozzle tubes, *i*, communicating with the interior of the cylinder. By this means the one tube, G, serves as a gage for both the oil and water, and will at all times indicate correctly the exact height of the dividing line between the two liquids contained in the cylinder.

A vertical pipe, J, connects between the feed-water pipe, A, and the oil cylinder; this pipe may be attached to the cylinder in any desired way, so that its lower end will discharge water into the bottom of the cylinder,—in the present instance a section, J', of the pipe is pendent within the cylinder and its lower open end is near the lower head, *c'*, of the cylinder. This section, J', has its upper end screwed into a union which is also exteriorly screw-threaded and entered as a bushing, *k*, into the upper head, *c*, of the cylinder. This bushing-union, *k*, joins onto the lower end of the upper section of the pipe, J. The bushing-union, *k*, has at its top, exterior octagonal sides which may be grasped by a wrench when it is desired to remove the section, J', of pipe within the cylinder. This pipe, nearest the feed-water pipe, A, is provided with a globe-valve, L, to open and close communication with the feed-water pipe, and also is provided with a union, *m*, which admits of breaking the pipe connection and detaching the oil-injector apparatus from the feed-water pipe whenever desired.

A glass tube, N, for the passage of the oil-drop, has its lower end connected with the upper metal chamber, *h*, which, as previously stated, has communication with the interior of the cylinder; this glass-tube is parallel with the vertical pipe, J. The upper end of this glass-tube is connected with another metal chamber, O, from which a short horizontal metal pipe, *p*, makes junction at, *n*, with the vertical pipe, J. The glass tube, N, and the horizontal pipe, *p*, together constitute an oil-feed pipe containing water. The glass tubes, G, and N, are in line with each other and their ends have a tight joint made with metal chamber, *h*, by means of a suitable packing, *q*, shown in Fig. 5.

A screw-shanked valve, *r*, in the chamber, *h*, controls the flow of oil from the cylinder, B, to the chamber, *h*, and thence to the gage tube, G, and also to the drop-feed tube, N. A similar valve, *r'*, controls the flow of water from the cylinder to the chamber, *h'*, and thence to the gage tube, G. A cock, *s*, in the lower metal chamber, *h'*, serves to draw off the water and oil from the gage tube, G, when the several valves, *r*, *r'*, have been closed.

The metal chamber, *h*, to which the two glass tubes, G, N, are both connected, has a screw-valve, *t*, independent of the one (*r*) which controls the flow of oil from the cylinder to the gage tube; this second valve, *t*, controls the flow of the oil from the chamber, *h*, to the drop-feed tube, N. This glass feed tube, when in operation, stands full of water, and the metal chamber, O, at its upper end has a screw-valve, *t'*, to assist in the control of the oil-drop-feed.

I provide a case or chamber, U, containing a restricted passage, *v*; this passage has a definite or invariable capacity and, relatively, is very much smaller than the main passage through the pipe, J, or the oil-feed pipe, N, *p*; while the internal cross area or size of this passage may vary it is preferably, in practice, about one thirty-second of an inch, or a little larger, in diameter. The case or chamber, U, containing this restricted passage is located in the line of the pipe, J, between the valve, L, and the junction, *n*, of the oil-feed pipe. By locating it as stated, the restricted passage is the sole communication always open for the out flow of the oil-drops to the feed-water pipe, and also the inflow of water drops from the feed-water pipe to the oil-cylinder, B. The oil being lighter than the water will seek to rise through the restricted passage, *v*, but, owing to this passage being so small, only one drop at a time can rise; no more than one drop at a time will rise for the reason that when the oil-cylinder, B, has released one drop of oil, it is not practicable to release any more until a drop of water has entered said cylinder to fill the space that was occupied by the released drop; therefore the practical operation is, first the flow upward through the restricted passage of a drop of oil, and then instantly the flow downward through the same passage of the same quantity of water. This restricted passage, *v*, has other functions; it provides for supplying the oil in drops with a constancy that will not vary by reason of changes in the pulsations of the feed-water caused by a change in the speed of the pump piston. Every stroke of the pump-piston causes a sharp pulsation in the water of the feed-pipe, A, and this pulsation has hitherto also agitated or disturbed the body of oil in the oil-receptacle; this agitation prevents the quiet feed by drops and causes the oil to spurt up through the glass tube, M, in irregular streams.

The restricted passage, *v*, in the location named prevents the pulsations of the pump from having any effect whatever on the body of oil in the cylinder, B,—the body of oil remains undisturbed no matter how much agitation may exist in the feed-water pipe, A. Another result of this passage, *v*, that seems to be advantageous in the action of the device, is that there is less pressure in the oil-cylinder than in the feed-water pipe. I have found by the gage that where the pressure in the feed-water pipe, A, is seventy pounds, the pressure in the oil-cylinder, B, will be only fifty-six pounds.

The restricted passage is made through a tapering or cone-shaped teat, *v'*, having at its base a circular disk, $v^2$, which is screw-threaded on the rim, $v^3$; this teat device is plainly shown in Figs. 2, 3 and 4. The case or chamber, U, containing the teat has it secured in the lower end—the cone or tapered point projecting upward; this forms in the bottom a collection cup, *w*, around the standing teat, for the reception of sediment that may be deposited from the water;—this arrangement of upward-pointed teat insures that the small passage, *v*, will not be choked by sediment.

The side of the case, U, has an opening closed by a screw-cap, *x*; by removing this cap the sediment in the collection cup, *w*, may be removed. The two glass tubes, G, and, N, are guarded by wires or rods, *z*, from being struck and broken.

Fig. 6 shows a portion of the apparatus in which the lower end of the glass feed tube, N, has a separate attachment, $h^2$, with the cylinder, instead of attaching to the metal chamber, *h*, in common with the gage tube, G.

From the description already given the operation of the improvements will be understood.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an oil-injector apparatus, the combination of the feed-water pipe; the oil-cylinder, B; the pipe, J, whose lower end communicates with the lower part of the oil cylinder; two metal valve-chambers, *h*, *h'*, each having a screw-nozzle communicating with the interior of the cylinder; a horizontal pipe, *p*, which makes junction with the pipe, J; a glass gage tube, G, between the said two valve-chambers; and a glass drop-feed tube, N, between the upper valve-chamber, *h*, and the said horizontal pipe.

2. In an oil injector for boilers, the combination of a feed-water pipe, A; an oil cylinder; a water-pipe, J, communicating between the said feed-water pipe and the lower part of the oil-cylinder; an oil drop feed pipe communicating from the oil-cylinder and making junction with the said water-pipe; a cut-off valve, L, on the water-pipe between the feed-water pipe, J, and the junction of the oil drop-feed pipe; and a passage, *v*, having a definite or invariable capacity and which is relatively much smaller than either the water-pipe or

oil drop-feed pipe—said passage being located in the line of the water-pipe between the said cut-off valve and the junction of the oil drop-feed pipe and which is the sole communication always open for the outflow of the oil-drops to the feed-water pipe, and also the inflow of water-drops from the feed-water pipe.

3. In an oil-injector apparatus, the combination of an oil-cylinder, B; the water-pipe communicating with the lower part of said cylinder; a glass gage tube, G; a glass drop-feed tube, N; a chamber, *h*, between the two glass tubes and having a screw-nozzle communicating with the interior of the cylinder; a valve, *r*, in the chamber to control the flow of oil from the cylinder to the chamber; and a second valve, *t*, to control the flow of oil from the chamber to drop-feed tube.

4. In an oil injector for boilers, the combination of a feed-water pipe, A; an oil cylinder; a pipe communicating between the said feed-water pipe and oil cylinder; and a case or chamber, U, provided with a side opening closed by a screw cap, *x*, and containing an upward-pointing teat, *v'*, having at its base a circular disk, $v^2$,—said case or chamber being located in the line of the communicating pipe between the feed-water pipe and the oil-cylinder.

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

GEORGE J. NOPPER.

Witnesses:
L. ISNEY VAN HORN,
C. CALVERT HINES.