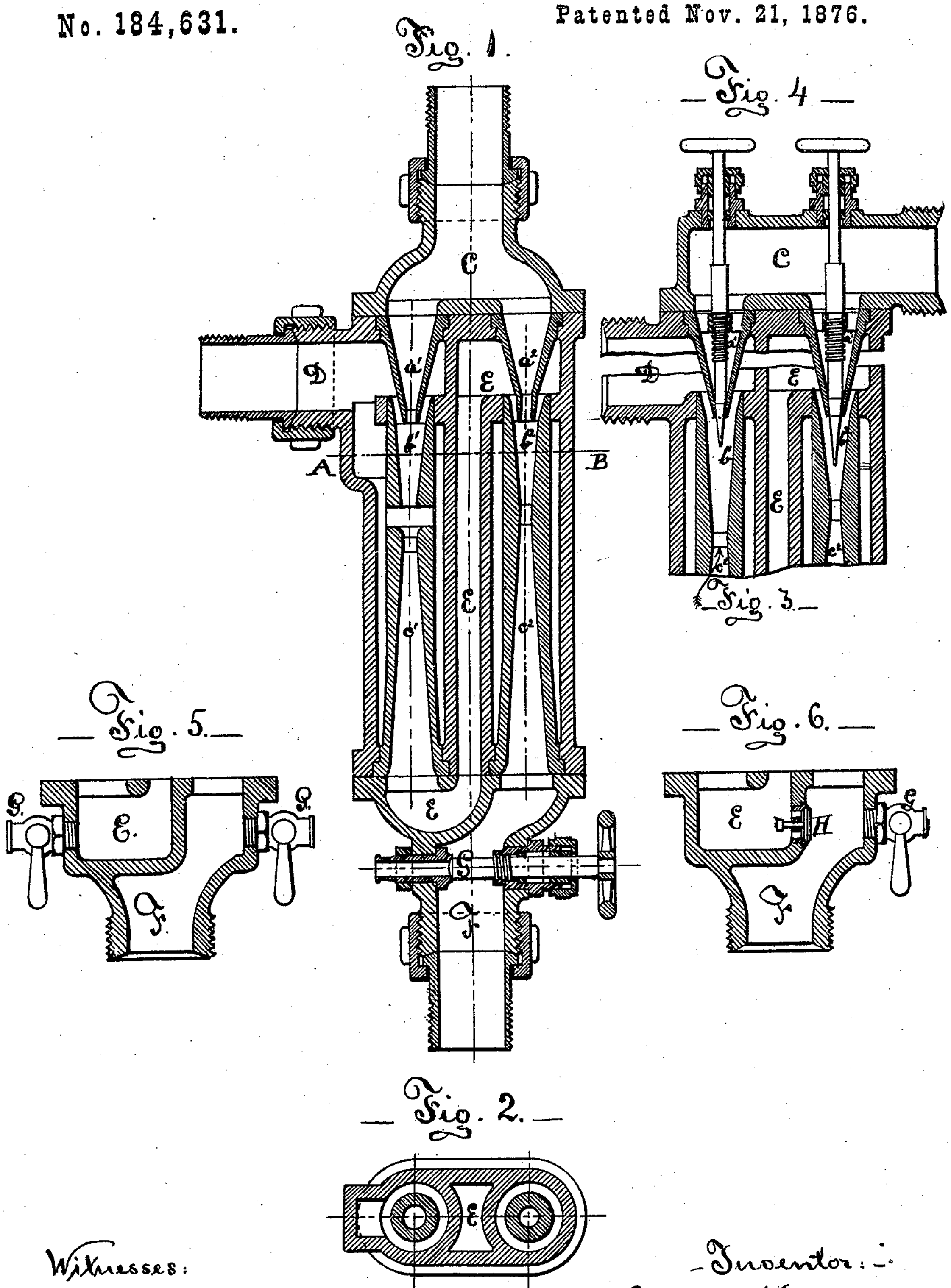
E. KORTING.

INJECTOR.

No. 184,631. Patented Nov. 21, 1876.



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UNITED STATES PATENT OFFICE.

ERNST KORTING, OF HANOVER, PRUSSIA.

IMPROVEMENT IN INJECTORS.

Specification forming part of Letters Patent No. **184,631**, dated November 21, 1876; application filed September 14, 1876.

To all whom it may concern:

Be it known that I, ERNST KORTING, of Hanover, in the Kingdom of Prussia, have invented certain Improvements in Injectors, of which the following is a specification:

The object of my invention is to feed water at a higher temperature, to make the apparatus self-regulating with fixed nozzles, to make its starting and action instantaneous and more positive, and to reduce to a minimum the quantity of the steam required for the induction of the jet.

For this purpose I divide the work to be done between several apparatuses, each apparatus complete in itself, containing a steam-nozzle, a combining-tube, and a diverging tube, in such a manner that the first apparatus takes the whole quantity of the liquid and delivers it to the second under pressure, the second to the third under increased pressure, and so on repeatedly, until the liquid has acquired the necessary pressure or speed.

In the accompanying drawings, only two apparatuses, with central steam-nozzles and annular water nozzles surrounding them, are shown; but the number may be increased indefinitely, as may also the arrangement be reversed—that is to say, central water-nozzles used with annular steam-nozzles surrounding them. The form or the combination may also be changed from that shown—as, for example, by arranging the several apparatuses side by side, they may be placed in line or in any other convenient form, the object being to have a communication between the discharge end of one apparatus and the water-space of the next one.

Figure 1 is a longitudinal section of a combination of two apparatuses.

a^1 is the steam-nozzle, b^1 the combining-tube, and c^1 the diverging tube, of the first apparatus. a^2 is the steam-nozzle, b^2 the combining-tube, and c^2 the diverging tube, of the second apparatus. C is the common steam-chamber; D, the water-inlet; E E, a passage leading the discharge of the first instrument to the water-space of the second; F, the discharge; G, a starting-cock, if the instrument be used as a boiler-feeder; and H, a check-valve forming a communication between the discharge end of the apparatus and the discharge end of the primary pump or apparatus.

Fig. 2 is a cross-section on the line A B of Fig. 1. Fig. 3 is a modification of the connection between the combining and diverging tubes of the first apparatus. Fig. 4 shows a modification of the steam-chamber, so that the steam-nozzles may be fitted with spindles or valves. Fig. 5 shows a modification of the discharge, each apparatus being fitted with a separate starting-cock. Fig. 6 shows another modification of the discharge, consisting in one starting-cock and a self-closing valve from the discharge end of each apparatus communicating therewith.

The same letters denote corresponding parts.

The principle involved in the invention is, that the water is delivered from one apparatus to the next one under pressure, which allows the water to be of high temperature, even above boiling-point, without interfering with the proper condensation of the steam. Passing the water from one apparatus to the next one, the pressure and temperature of the water are successively and correspondingly increased until it is discharged from the last one at the required pressure and maximum temperature. By this means the first apparatus, with its proportionately small steam-nozzle, acts as the governor for the rest, increasing and decreasing the quantity of the water which it delivers to the following apparatus with the increase and decrease of the steam-pressure, and thereby making the action of the apparatus self-regulating without adjustment of parts, or the necessity of having an open overflow to the atmosphere.

By reason of the proportionately small steam-nozzle in the first instrument the water can be taken very hot, up to 175° Fahrenheit, and as the combination of the steam and water in the following instruments takes place under pressure, a high temperature does not interfere with a proper condensation of the steam, and the discharge out of the last apparatus can be made much above the boiling-point. This successive increasing of the pressure of the water is also conducive to the proper utilization of the heat contained in the steam, as no loss takes place through sudden shocks,

and the whole heat of the steam is transferred to the discharge.

The valve G is for the purpose of enabling the pump to be started readily when arranged to work against a high counterpressure, the valve being opened when the operation is to commence, so that the pump will start against the mere pressure of the atmosphere, instead of against the high pressure to which it is finally opposed. The check-valve also facilitates the starting of the apparatus by allowing the steam and fluid to pass from the delivery end of the primary pump or apparatus to the outlet-valve G. After the operation of the apparatus is fully established, the check-valve is closed by the excess of pressure on its outer side over that on the inner side.

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

1. The combination, substantially as shown and described, of two or more steam-jet apparatuses in such manner that one discharges into the combining-chamber of the next.

2. The combination of two or more steam-jet apparatuses in such a manner that one discharges into the combining-chamber of the next one, the first one of these apparatuses having no overflow communicating with the atmosphere.

3. In a steam-jet apparatus consisting of two or more jet-pumps delivering one to another, an outlet-valve, G, located at the final delivery of the apparatus, and one or more valves, H, forming a communication between the final outlet and the outlet or discharge ends of the primary pump or pumps, substantially as shown, for the purpose of enabling the apparatus to start quickly.

E. KORTING.

Witnesses:
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