(Model.)

2 Sheets—Sheet 1.

# E. W. VANDUZEN.

## STEAM WATER ELEVATOR.

No. 265,895. Patented Oct. 10, 1882

Fig. 1.

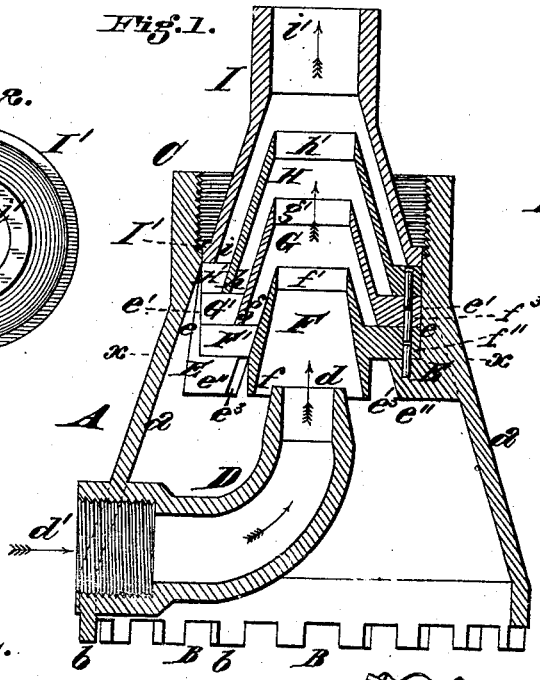


Fig. 2.

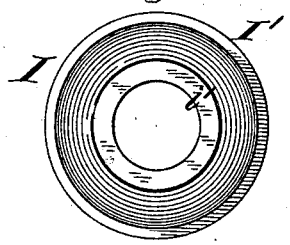


Fig. 3.

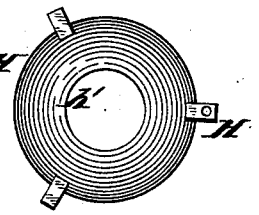


Fig. 4.

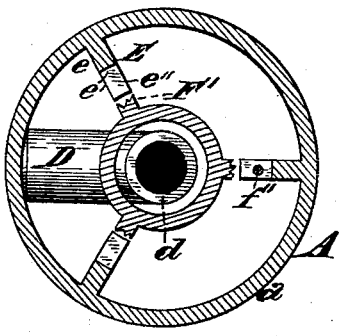


Fig. 5.

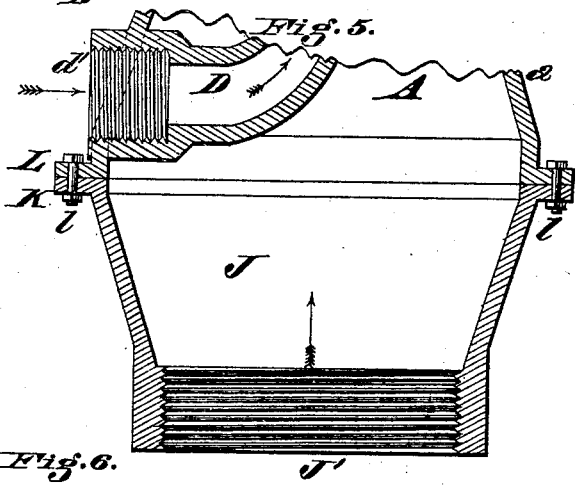
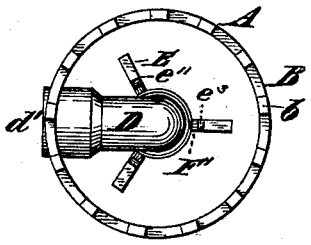


Fig. 6.



Attest

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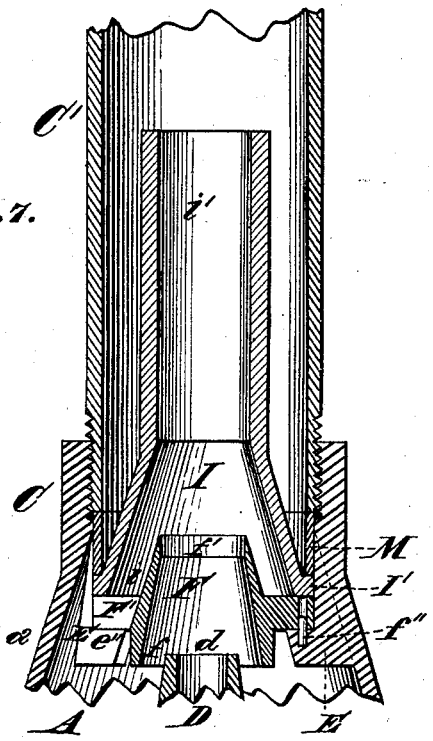
(Model.) 2 Sheets—Sheet 2.

# E. W. VANDUZEN.

## STEAM WATER ELEVATOR.

No. 265,895. Patented Oct. 10, 1882.

Fig. 1.




Attest
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J. E. Wiles

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by Wood & Boyd
his Attorneys &c.

# UNITED STATES PATENT OFFICE.

EZRA W. VANDUZEN, OF NEWPORT, KENTUCKY.

## STEAM WATER-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 265,895, dated October 10, 1882.

Application filed October 27, 1881. (Model.)

*To all whom it may concern:*

Be it known that I, EZRA W. VANDUZEN, a citizen of the United States, and a resident of Newport, in the county of Campbell and State of Kentucky, have invented certain new and useful Improvements in Steam Water Elevators or Ejectors, of which the following is a specification.

My invention relates to an ejector or steam water-elevator; and it relates more particularly to improvements in that class of ejectors described and claimed in Letters Patent numbered 235,109, granted to me December 7, 1880.

It consists primarily and generally in providing, in connection with a truncated conical shell constructed with fluid-supply opening or openings and upturned steam-supply nozzle at its lower end, one or more inner truncated conical discharge-nozzles of increasing diameters resting on bracket-seated guide-ribs formed on the inside of the shell in suitable relation with the exit-orifice of the steam-nozzle, and applied to be used singly or in a series, and an outer conical discharge-nozzle formed with an elongated discharge pipe or tube at its top, of uniform internal diameter throughout its length within the discharge throat and pipe at the top of said shell, the discharge-nozzles being retained in position by the discharge-pipe resting on an annular seat or flange of the outer discharge-nozzle.

Other features of my invention will be fully set forth in the following description of the accompanying drawings, in which—

Figure 1 is a central sectional elevation of my improved ejector in the preferred form. Fig. 2 is a plan of the outer discharge-nozzle. Fig. 3 is a plan of one of the supplemental discharge cones or nozzles. Fig. 4 is a horizontal sectional plan on line *x x*, Fig. 1. Fig. 5 is a broken central sectional elevation of a modified form of pump, showing the manner of attaching a lower chamber for connection with a fluid-supply pipe. Fig. 6 is a bottom plan of Fig. 1, shown reduced. Fig. 7 is an elevation of the elongated outer discharge-nozzle within broken central sections of the discharge throat and pipe.

A represents the shell or body of the ejector, preferably of truncated conical form, having its sides *a* at any suitable inclination, from forty-five to eighty degrees.

B represents recesses or openings in the bottom of shell A for the entrance of fluid to the pump, the lugs *b* between the openings forming legs upon which the pump is supported.

C represents the neck or discharge-throat of shell A. It is screw-threaded internally to receive a suitable discharge-pipe, C′. (Shown in Fig. 7.)

D represents a steam inlet or nozzle, preferably cast solid with the shell at or near its lower edge and curving upward, its exit-orifice *d* being central to the outer shell and terminating at a point below the discharge-throat C, the said curvature of the nozzle giving the proper direction to the steam into the throat and pipe C C′. The nozzle D is provided with an inner screw-thread at its entrance *d′* for the reception of a steam-supply pipe.

E represents three or more bracket-seated guide-ribs cast on the inside face of shell A. The upper parts, *e*, of brackets E terminate at a point immediately below and adjoining the screw-threads of throat C, the faces *e′* being in a line with the inner diameter of said throat. At the lower ends of brackets E are lugs or arms *e″*, projecting centrally a short distance and forming seats for the support of supplemental discharge-nozzles F G H I, hereinafter described. The faces *e*³ of lugs *e″* are inclined at the same angle as the sides *a* of the shell, as shown in the drawings, to conform to the general angle of the various parts of the pump.

F represents the lowermost supplemental discharge-nozzle. It is of truncated-cone shape, having inlet openings *f* and a contracted exit-orifice, *f′*. The upper end of steam-nozzle D stands within the opening *f* of nozzle F.

F′ represents radial arms or lugs cast on the outer face of nozzle F, by which it is supported and seated on the bracket-lugs E *e″*, being secured in place by upright pin *f″*, set into the upper face of one of the lugs *e″*, and which enters a perforation made in one of the arms F′, to receive it.

*f*³ represents a pin set into one of the arms F′, immediately above the perforation or socket for receiving pin *f″*, above described.

G and H represent supplemental discharge-nozzles, similar in construction to nozzle F, but having their radial arms G′ H′, which correspond with those on nozzle F, cast at their lower edges, and on a line with their inlet-

openings *g h*, which are of increasing diameters, each one telescoping the other, as shown in Figs. 1 and 7. The arms G′ H′ of nozzles G H seat on arms F′ of nozzle F, and are provided with similar pins and sockets for securing them concentrically in place.

*g′ h′* represent the exit openings or orifices of nozzles G H. They are preferably of uniform diameter with the exit-orifice *f′* of nozzle F, and are arranged in a direct line with the same when it is desired to use a series of nozzles, as shown in Fig. 1.

I represents an outer truncated conical discharge-nozzle having a bell-shaped mouth or inlet-opening, *i*. I′ represents a peripheral flange at the base of nozzle I, forming a seat for the discharge-pipe C′, which jams up against it to secure the nozzles in position.

*i′* represents an extension on the upper end of nozzle I, forming an elongated cylindrical pipe or tube, through which, owing to its uniform internal diameter, fluid entering it will pack and pass upward in a solid body or column without spraying, and thereby attain a good head, which is a very important feature of my invention. The pipe or extension *i′* may be of the form and length shown in Fig. 1, or of greater length, as shown in Fig. 7, the length varying according to the size and capacity of the pump. The inlet-openings *f g h i* of nozzles F G H I are of progressive diameters, so that the fluid will pass through and around nozzles. The angle of inclination of the inside and outside walls of the nozzles F G H I is in the same relative plane with the sides *a* of shell A, as hereinbefore described, which uniformity of the various parts of the pump permits the free passage of fluid through it without the slightest retardation.

Instead of the openings B at the bottom of the pump, a shell, J, with flange K formed at its upper peripheral edge, and an internal screw-thread, J′, at its bottom, may be provided for connection by a pipe with the fluid to be ejected.

L represents a flange on the bottom of shell A, Fig. 5, which fits flange K on shell J, the two chambers being secured together by bolts *l* passing through said flanges K L.

An important advantage is obtained by the use of my series of discharge-nozzles. The lower nozzle being of but small area, the annulus around the pipe D admits but a small volume of water as compared to the volume of steam ejected. Hence but a small amount of condensation of steam occurs within the first supplemental nozzle. The second nozzle admits about the same amount of water as the first, and this is continued at pleasure by increasing the number in the series, the effect of which is to utilize a much greater amount of the velocity and pressure of the steam, and a consequent elevation of a larger column of water than could otherwise be attained.

Another important advantage is obtained by having the upper nozzle terminate in cylindrical form, which prevents the spraying of the water which occurs when the diverging or bell-shaped form is used.

By the construction and arrangement of my discharge-nozzles seating on the lugs *e″*, and each additional nozzle provided with arms which form seats, so that the several nozzles seat one upon the other, and the top being provided with an annular seat, upon which the discharge-pipe rests when it is screwed in position, holding the parts firmly in place, another important advantage is obtained.

When a less number or but a single discharge-nozzle is used in connection with the outer discharge-nozzle an annular cylinder or ring, M, resting on the flange I′ of outer discharge-nozzle, I, should be employed, as shown in Fig. 7, with its top edge terminating just above and near the bottom of the screw-threads in the discharge-throat C, forming a packing-ring for the bottom of the screw-thread, and filling up the space between the lower screw-threaded end of the discharge-pipe C′ and the annular flange I′, the lower end of said discharge-nozzle I resting on the arms F′ of nozzle F.

The truncated conical shell and conical discharge-nozzles, being at the same angle of inclination, allow the fluid to have an unobstructed and direct flow toward the steam-jet from the bottom of the shell to the discharge end of the inner or supplemental discharge-nozzles.

The conical shell having its smaller diameter above the inner or supplemental discharge-nozzles, and on a line with the larger diameter of the top or outer discharge-nozzle, and all the nozzles having increasing diameters at their inlet-openings, beginning with their lowermost nozzle, upward, permit the water or fluid to have an unobstructed flow toward them, and at the same time bringing the lower ends or mouths of the said nozzles close to the water or fluid to be ejected.

I claim—

In a steam water elevator or ejector, the conical shell A, having the upturned pipe D, terminating centrally therein, the internal radial brackets, E, having the inclined faces *e³*, and the plain cylindrical surface *e′*, and a screw-threaded surface, in combination with one or more tapering nozzles, F, of increasing diameters, having the radial arms F′, and an annular space between its larger end and the upper end of the pipe D, and the conical nozzle I, having the annular flange I′ at its lower end and the cylindrical pipe *i′* at its upper end, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EZRA W. VANDUZEN.

Witnesses:
JOHN E. JONES,
J. H. CHARLES SMITH.