

(No Model.)

2 Sheets—Sheet 1.

C. G. WATERBURY, Dec'd.

C. R. WATERBURY, Executrix.

SNOW MELTING AND GROUND HEATING MACHINE.

No. 328,367.

Patented Oct. 13, 1885.

Fig. 1.

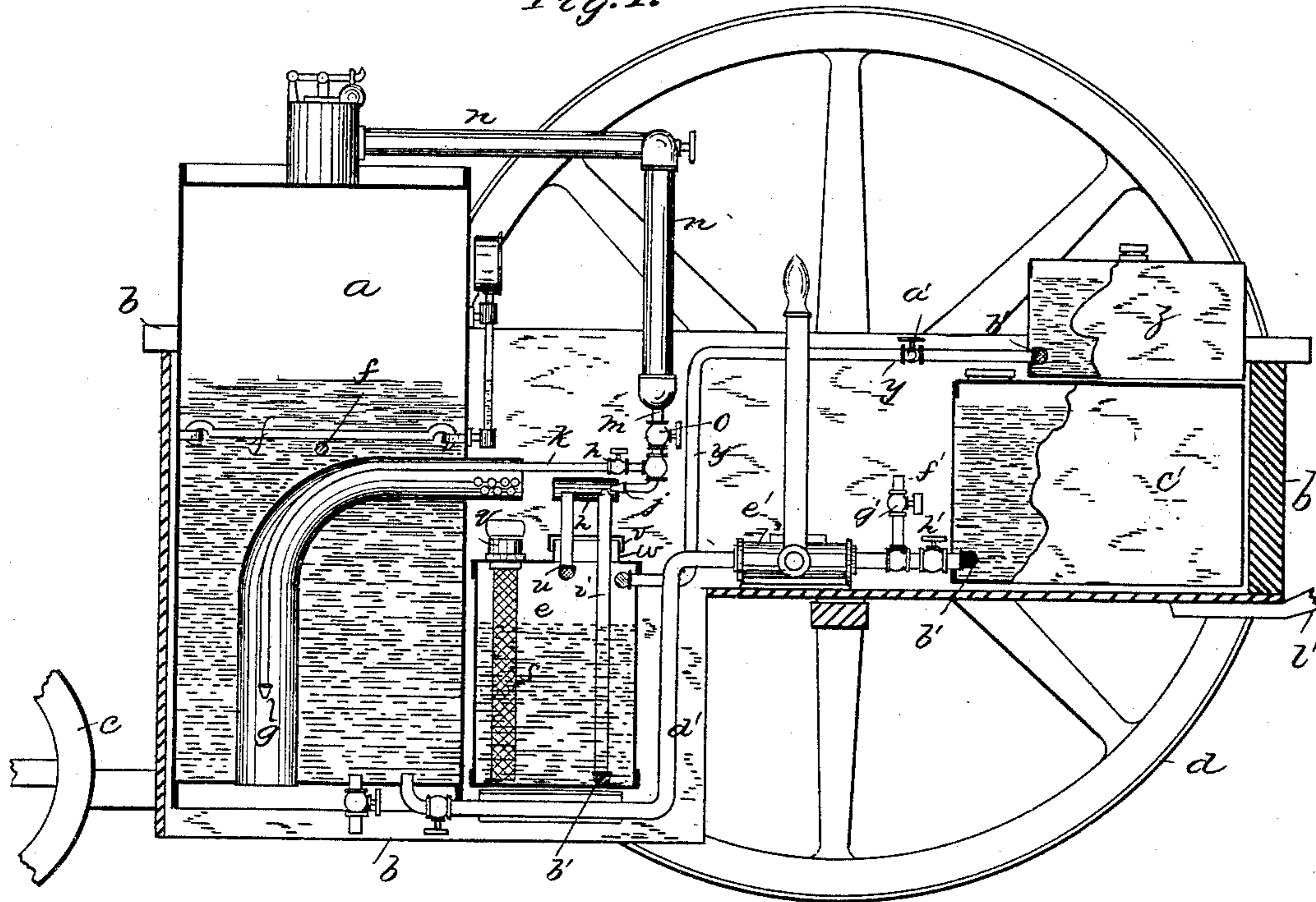
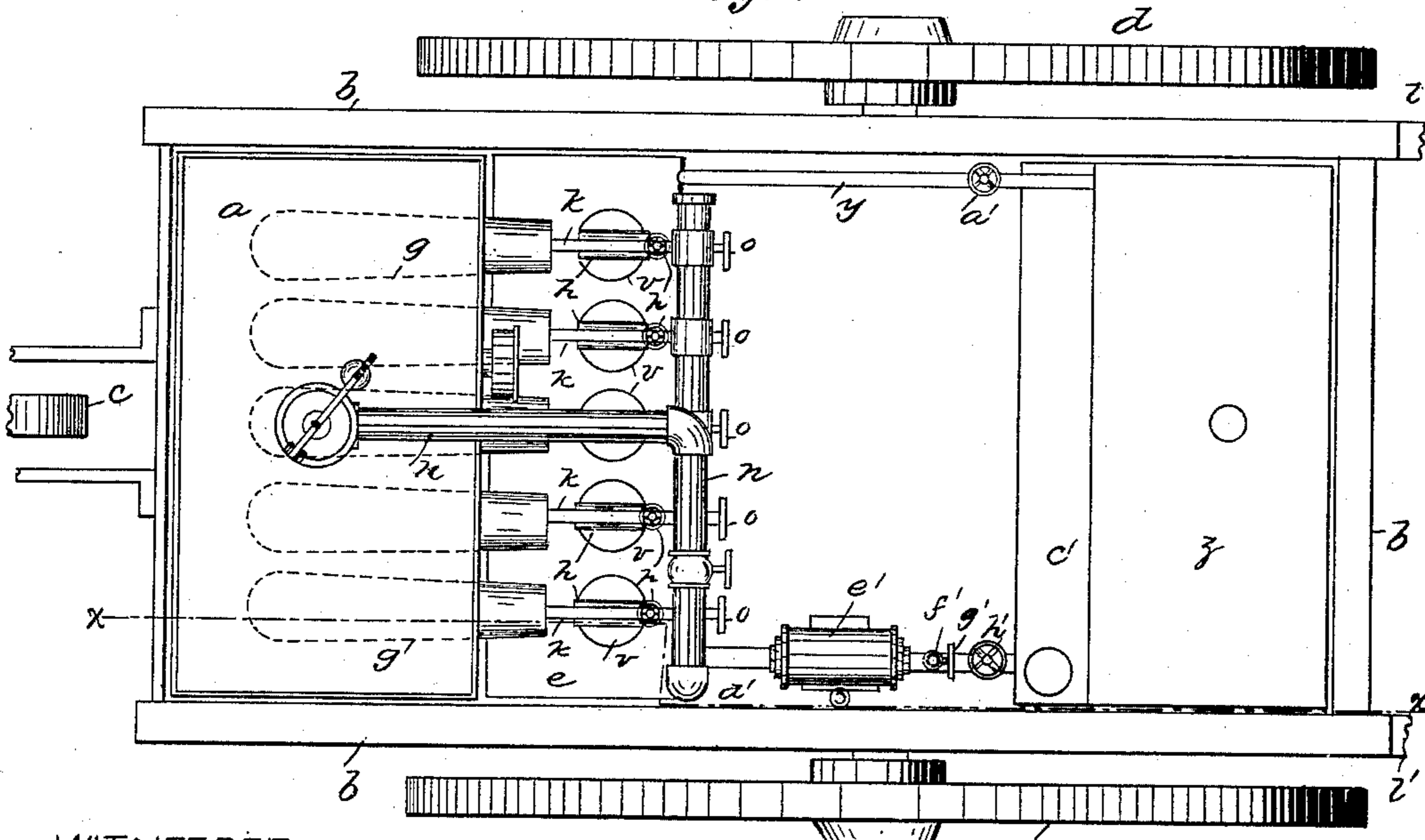


Fig. 2.



WITNESSES.

*W. H. Morgan.*  
*A. P. Thayer.*

INVENTOR.

*C. G. Waterbury*  
*By A. P. Thayer*  
*att'y*

(No Model.)

2 Sheets—Sheet 2.

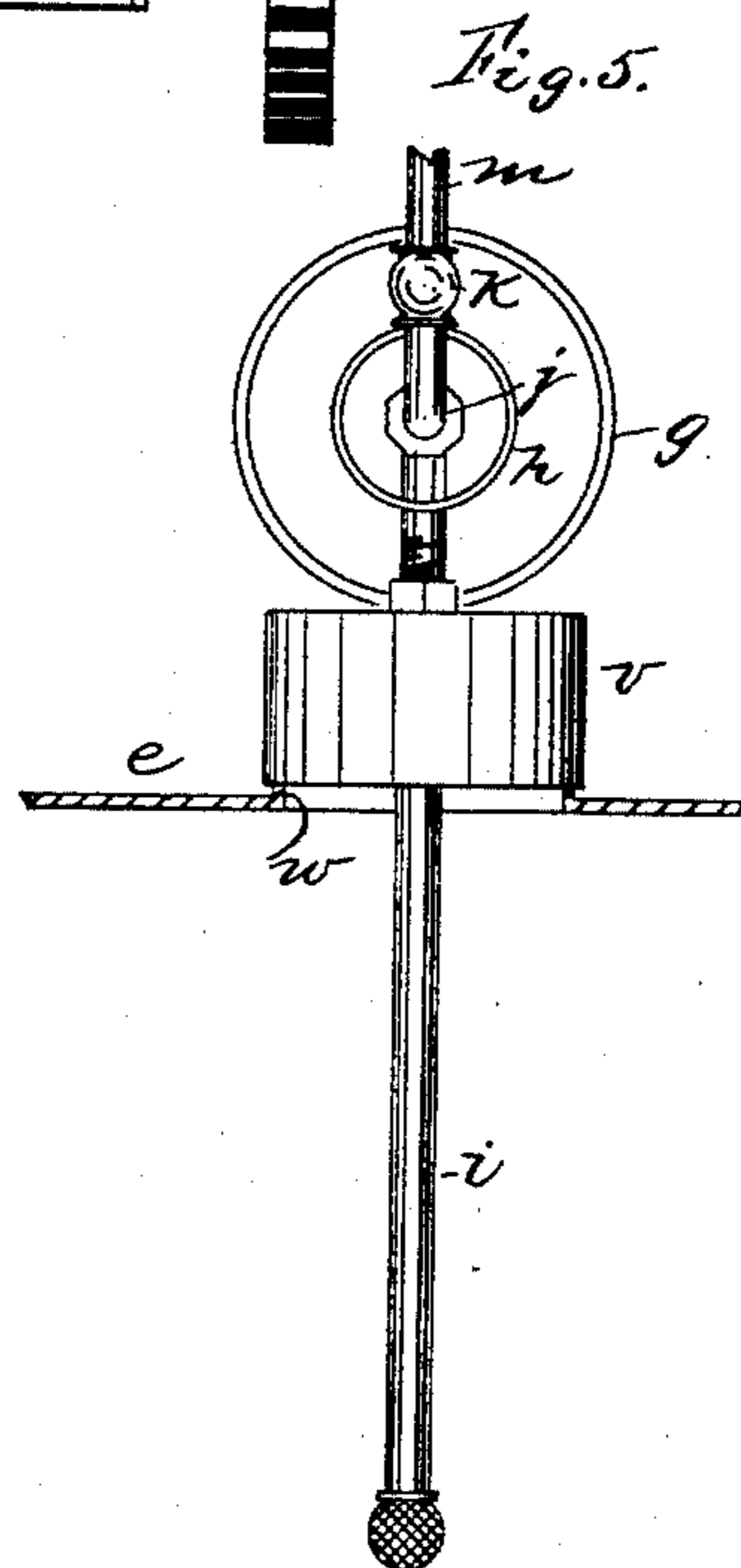
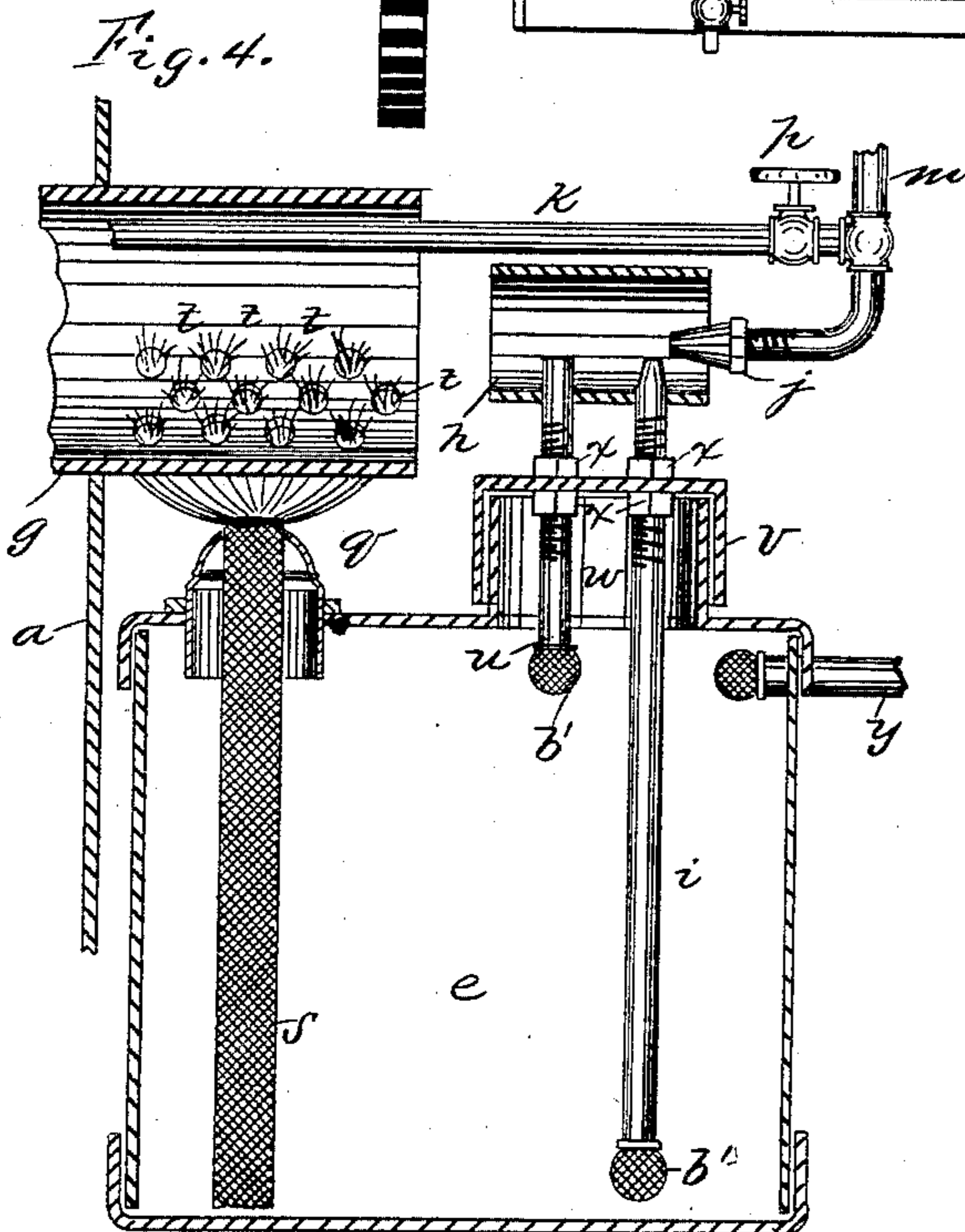
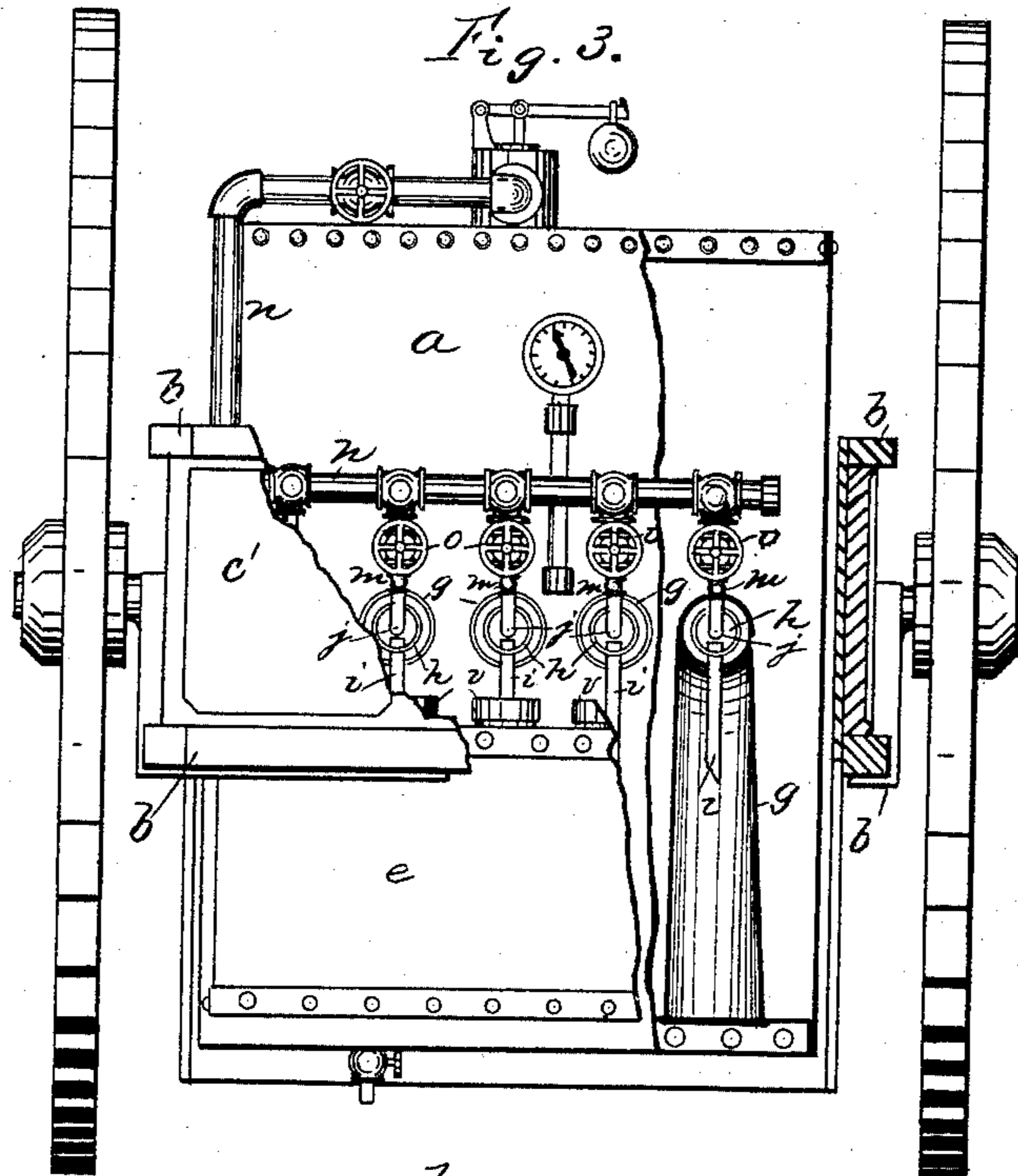
C. G. WATERBURY, Dec'd.

C. R. WATERBURY, Executrix.

SNOW MELTING AND GROUND HEATING MACHINE.

No. 328,367.

Patented Oct. 13, 1885.



WITNESSES.

*W. H. Morgan.*  
*A. P. Thayer.*

INVENTOR.  
*Chas. G. Waterbury.*  
*By A. P. Thayer.*  
*att'y*

# UNITED STATES PATENT OFFICE.

CHARLES G. WATERBURY, OF NEW YORK, N. Y.; CAROLINE R. WATERBURY,  
EXECUTRIX OF SAID CHARLES G. WATERBURY, DECEASED.

## SNOW-MELTING AND GROUND-HEATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 328,367, dated October 13, 1885.

Application filed March 6, 1885. Serial No. 157,977. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES G. WATERBURY, a citizen of the United States, residing at New York city, in the county and State of New York, have invented new and useful Improvements in Snow-Melting and Ground-Heating Machines, of which the following is a specification.

My invention consists of improvements in apparatus for generating heat by the use of hydrocarbon substances for the fuel, and steam for supplying and mixing the oxygen with the fuel, and for forcibly directing the heat on the ground in a portable machine consisting of a truck having the heat-generating apparatus mounted on it suitably to be moved along over the ground by rolling the truck along on its wheels, said truck being in this case, and preferably, constructed in the form of a three-wheeled push-cart to be operated by hand, which is a form well adapted for heating apparatus of medium capacity for melting snow on the streets and sidewalks; but for larger and more capacious machines the trucks will be adapted for being drawn by horses.

My invention also consists of simple contrivance of the heat-generating apparatus, both for delivering the heat on the ground, and with relation to the steam-generator for also serving to generate the steam, and for the protection of the truck and the attendant from undue heat of the said heat-generating apparatus, all as hereinafter fully described, reference being made to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation of my improved machine, taken on the line *x x* of Fig. 2, which is a plan view of the same. Fig. 3 is a rear elevation of the machine with some of the parts in section. Figs. 4 and 5 are details illustrating the heat-generating apparatus.

I arrange a boiler, *a*, in which steam is to be generated, on the front portion of the truck-frame *b*, between the guiding-wheel *c* and the carrying-wheels *d*, with an oil-tank, *e*, close along the rear side of the boiler, both of which I prefer to extend across the whole breadth of the truck-frame from side to side, making the oil-tank considerably lower than the top of the boiler, and if necessary staying the

boiler and tank with stay rods or bolts *f*. Within the boiler I arrange a series of rather large-sized curved tubes, *g*, to extend a little back of and through the rear side of the boiler horizontally into it a little below the water-level and down through the bottom of the boiler, the several pipes of the series being placed side by side a suitable distance apart, and the whole forming a range extending from side to side of the boiler, or thereabout. Behind the rear ends of these tubes, which project from the rear of the boiler a short distance above the top of the oil-tank *e*, I arrange a Bunsen burner to each one, consisting of a short horizontal tube, *h*, located a little back of and in the axis of the tube *g*, and connected with a tube, *i*, for the supply of oil from the tank, with a nozzle, *j*, of a steam-pipe located at the rear, suitably for blowing a jet of steam over the top of oil-pipe *i*, to raise the oil by suction and atomize it; also to forcibly inject the atomized oil and the necessary oxygen for creating powerful combustion into tube *g*, and project the flame along and down therein, both for generating the steam to be used for raising the oil and supplying the oxygen and for delivering powerful blasts of flame on the ground.

To increase the force of the combustion and the force of the hot blasts thereof on the ground, I arrange a steam-pipe, *k*, along in the tubes *g*, with a nozzle, *l*, located well along toward the lower end, for delivering thereat another jet when it may be required. These jet-pipes *j* and *k* are connected with a branch, *m*, of a main pipe, *n*, through which steam is supplied from the boiler, and said branches and the pipes *k* have cocks *o* and *p*, respectively, for controlling the jets, the cock *o* being to shut off both jets, and cock *p* shuts off the jet from pipe *k* without interrupting the other. For igniting these burners I arrange an ordinary lamp-burner, *q*, on tank *e*, under the projecting end of each tube *g*, and with a wick, *s*, extending down into the oil, to get its supply of oil independently of the principal burner, and to continue burning, so as to relight the others whenever it may be required to start them again after being stopped, which will probably be frequently required in the use of these machines. The parts of the tubes

*g* under which the lamps *g* burn have perforations *t*, through which the flames of the lamps rise sufficiently to ignite the oil vapors or sprays injected when the jets are let on through nozzles *j*, and the perforated extensions of tubes *g* form guards which prevent the lamp-flames from being extinguished by the blasts from the steam-jets.

The oil-tube *i* extends to the bottom of the oil-tank, both for the purpose of drawing up the heavier portions settling down and preventing deposits of dense matter and for being capable of drawing out the entire contents of the tank when required; but as with only one tube thus arranged vapor will collect in the gradually-increasing space above the oil, by which some danger of explosion might arise under some circumstances, I provide another suction-tube, *u*, a short distance from tube *i*, in the line of the direction of the blast from the nozzle, and subject to the influence of the same, to draw up and discharge the vapor into the flame, to be consumed as fast as generated, and thus prevent the accumulation of any undue quantity in the tank. These tubes *i* and *u* are attached to a cap, *v*, that fits down tightly on a nozzle, *w*, of the top of the tank, but is readily removable from said nozzle, and the pipes are adjustable in said cap by the check-nuts *x*, for regulating them with relation to the nozzle, which is also adjustable lengthwise on the pipe to which it is attached for setting it with relation to pipe *i*.

For refilling the oil-tank *e* from time to time as the contents are consumed, it is connected by a pipe, *y*, with a larger tank, *z*, in which a reserve is provided, said reserve-tank being placed in a higher position, so that the oil will flow into tank *e* whenever the passage is opened by the cock *a'*. This pipe and the pipes *i* and *u* have wire-gauze safety-caps *b'* on the ends for protection in case of the accidental ignition of the oil in either of the tanks and for preventing the clogging of the pipes with matters floating in the oil.

A reserve of water for the supply of the boiler is provided in a tank, *c'*, from which it is to be pumped into the boiler through the pipe *d'* by the pump *e'*, which may be a hand, steam, or power pump, as preferred. To the suction side of this pump or to another, if it may be preferred to use a separate pump, I connect a branch, *f'*, opening into the air, with a cock, *g'*, for closing it, and with a cock, *h'*, in the water-pipe, in case said branch is connected to it, as here shown, for pumping air into the boiler to create pressure for producing the burner-jets to raise steam at the beginning of the work.

It will be seen that the contrivance of the tubes *g* and burners with the boiler enables the one set of burners to be utilized effectively, both for generating the steam and heating the ground, and the boiler serves to prevent the truck or any part of it from being overheated

by direct contact of heat, which cannot reach the truck except through plates having contact with the water, which keeps the temperature of the plates down to that of the water and steam, or thereabout.

It will also be seen that the contrivance of the burners is of the most simple and efficient character, and the location of them with relation to the boiler and the tubes by which the heat is conducted to the ground enables them to be always in view, to afford the operator the best means of inspection for gaging the regulating-cocks, and also affords the most ready access for repairs.

The boiler and the burner-tank are located forward of the axle of the carrying-wheels, and the oil and water reserve tanks are placed in rear of the axle, and thus the machine is balanced sufficiently to enable the operator to handle it conveniently with push-handles *l'* of approved length.

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

1. In a ground-heating machine having vapor-burners and steam-jet apparatus for generating the heat, the conductors for delivering the heat on the ground incorporated with the steam-generator, substantially as described, for protection of said conductors from the heat and for utilizing the waste heat for generating the steam, substantially as described.
2. In a ground-heating machine, the combination, with the boiler, of burners located at one side of the boiler, and conducting-tubes extending from said burners into and down through the boiler substantially as described.
3. The combination of the horizontal burner-tube *h*, oil-supply tube *i*, and steam-nozzle *j*, with the conducting-pipe *g*, extending out through the side of the boiler, and with said boiler, substantially as described.
4. The combination of the lamp *g*, perforated projecting conducting-pipe *g*, burner *h* *i* *j*, and the steam-boiler, said conducting-pipe extending down through the bottom of the boiler, substantially as described.
5. The combination of the boiler *a*, conducting-pipes *g*, jet-pipes *k*, burners *h* *i* *j*, and the oil-supply tank *e*, substantially as described.
6. The combination, with the boiler and vapor-burners *h* *i* *j*, of an air-injecting feed-pump adapted to provide air-jets for operating the burners in lack of the steam, substantially as described.
7. The combination, with the oil-tank *e* and vapor-burners *h* *i* *j*, of the safety vapor-tube *u*, adapted to exhaust the vapor from the space above the oil and discharge it into the burner, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CHARLES G. WATERBURY.

Witnesses:

W. J. MORGAN,  
S. H. MORGAN.

Correction in Letters Patent No. 328,367.

It is hereby certified that Letters Patent No. 328,367, issued October 13, 1885, upon the application of Charles G. Waterbury, of New York, New York, for an improvement in "Snow-Melting and Ground-Heating Machines," were erroneously granted to "Caroline R. Waterbury, as executrix," whereas said Letters Patent should have been granted to *Cornelius R. Waterbury, as executor* of said Charles G. Waterbury, deceased; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 3d day of November, A. D. 1885.

[SEAL.]

H. L. MULDROW,  
*Acting Secretary of the Interior.*

Countersigned:

M. V. MONTGOMERY,  
*Commissioner of Patents.*