A. SMITH.

Liquid Mash Cooler.

No. 41,025.

Patented Dec. 22, 1863.

Fig. 1.

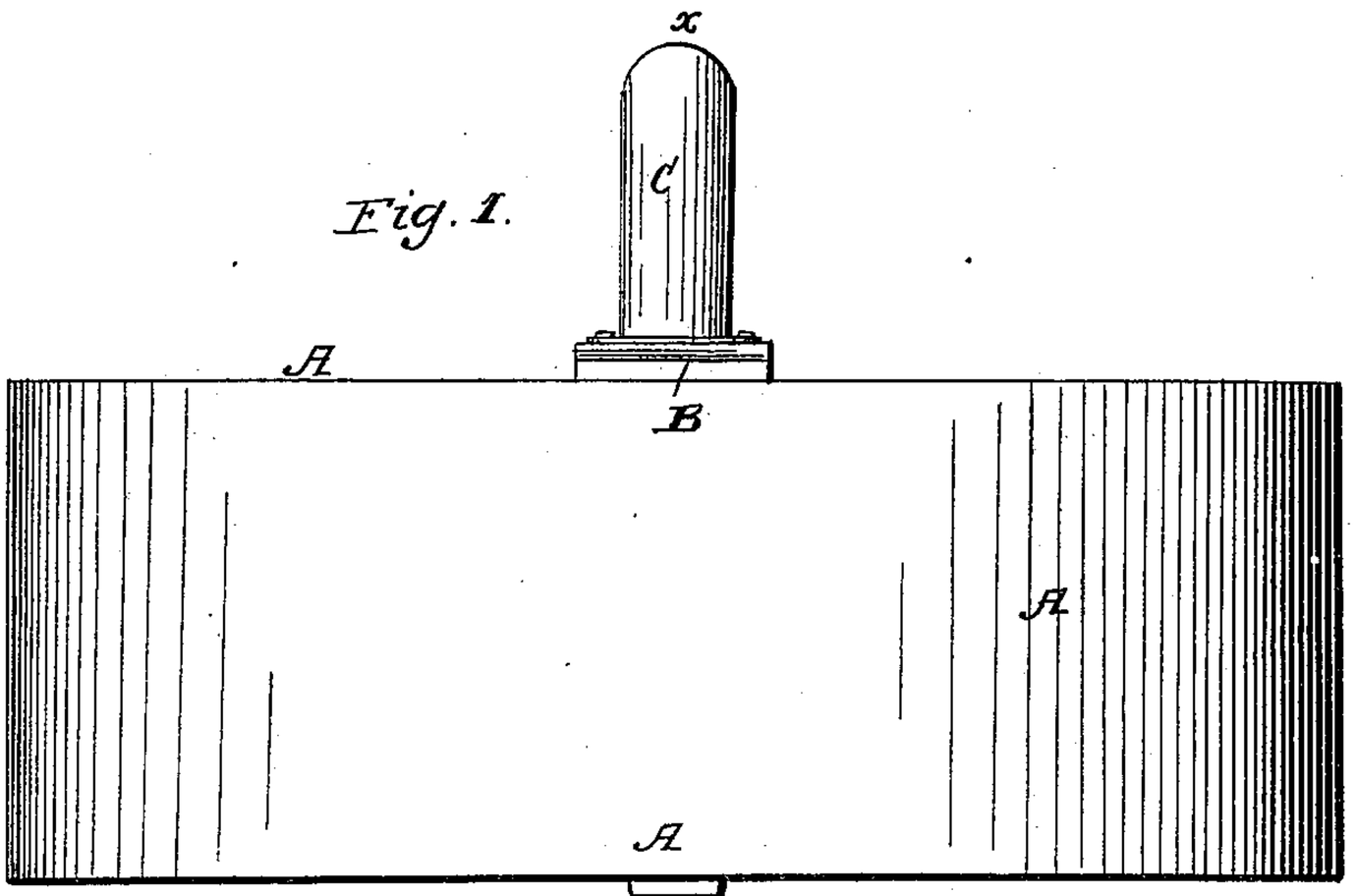
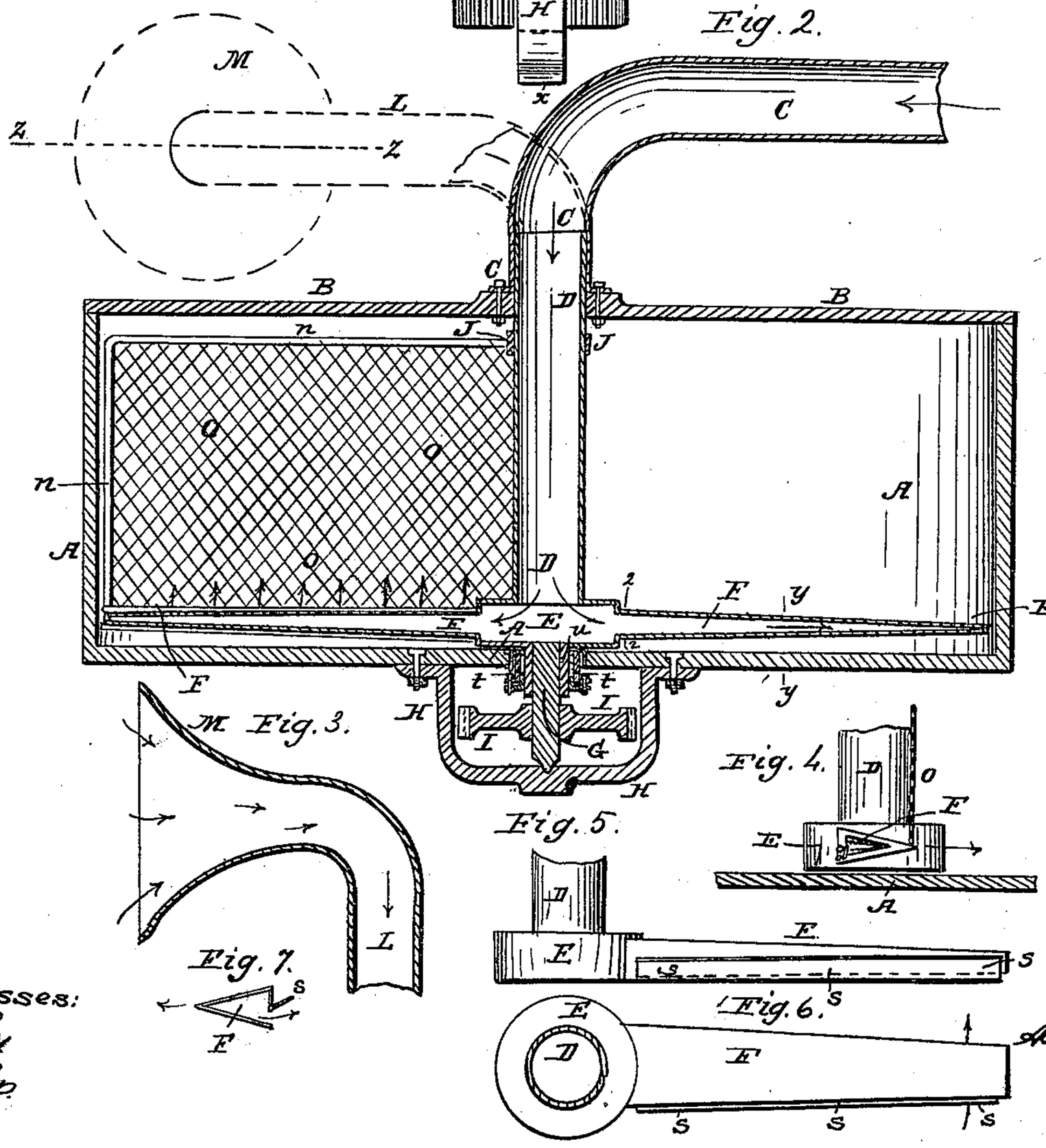


Fig. 2.



M Fig. 3.

Fig. 4.

Fig. 5.

Fig. 7.

Fig. 6.

Witnesses:
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Inventor:
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By his attorney
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UNITED STATES PATENT OFFICE.

ADDISON SMITH, OF NEW YORK, N. Y.

IMPROVED APPARATUS FOR COOLING LIQUIDS.

Specification forming part of Letters Patent No. **41,024**, dated December 22, 1863.

To all whom it may concern:

Be it known that I, ADDISON SMITH, of New York city, in the State of New York, have invented certain new and useful Improvements in Apparatus for Cooling Warm Liquids; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this application.

My present invention relates to an improved apparatus or machinery for cooling the mash of beer or other material by forcing blasts of air through the mass of warm material.

Previous to my invention an apparatus has been employed in which the mash was contained in a tank or vessel and embracing a suitable device for stirring or agitating the material, and a means of blowing or forcing blasts of air onto the surface of the material.

In an application for Letters Patent lately filed by me in the United States Patent Office a new process of cooling the mash of beer is described and claimed, consisting in emitting the blast or blasts of air into the mass of warm material near the bottom of the vessel containing it and allowing it to ascend through the mass while the latter is kept in a state of motion or agitation.

The apparatus made the subject of this application is designed to carry on the process of cooling substantially as described in my previous application.

My present invention has for its objects a simple, economic, and durable form of machine, and one which may be worked with great ease and effectiveness; and to these ends my invention consists in the employment, in connection with a suitable vessel for containing the mass of material, of a hollow shaft for conducting the blast into the interior of the vessel in combination with one or more air-tubes extending from said hollow shaft and arranged near the bottom of the vessel or tank, through which a blast of air is conducted, and from which it is discharged into the mass of material, as hereinafter more fully explained.

And my invention also consists in providing the arms or tubes through which the blast is discharged into the mash with suitable valves or cut-offs, by which the mash is prevented from entering the air-spaces when the air-tubes are in a state of rest, as will be presently more fully explained.

To enable those skilled in the art to make and use my invention, I will proceed to describe the construction and operation of my improved apparatus, referring by letters to the accompanying drawings, forming part of this application, and in which—

Figure 1 is a side elevation of my improved machine. Fig. 2 is a vertical section of the same, taken at the line *x x*, Fig. 1. Fig. 3 is a detail section at *z z*, Fig. 2. Fig. 4 is a detail section at *y y*, Fig. 2, showing the form of the blast arms or tubes. Fig. 5 is a partial elevation of the blast pipe or shaft and one of the arms, showing a back view of the arm and its valve or cut-off. Fig. 6 is a top view of one of the blast-arms; and Fig. 7 is a cross-section of one of the blast-arms at 2 2, Fig. 2, showing the valve or cut-off open, as when the machine is in operation.

In the several figures the same letters of reference will be found to indicate the same part of the apparatus.

The portions tinted pink lie in the plane of section, and those parts tinted blue are the spaces filled with the blast.

A is a large tub or tank, in which the material to be cooled is put. Across the open top of this tank A is securely arranged a bar or beam, B, in the center of which is formed a suitable bearing for the blast-pipe C, which is securely fastened to said bar B, as shown.

D is a hollow vertical shaft, the upper end of which runs within the blast-pipe C, as seen at Fig. 2, and the lower end of which is formed or provided with a short drum, E, below which extends a hub, *u*, that passes through the bottom of the tank A, and in which is keyed a short vertical shaft, G, which is supported or stepped in the hanger or frame H, bolted to the bottom of the tank. The bottom of the tank is provided where the hub *u* passes through it with a suitable stuffing-box, *t*, in which the hub *u* runs, forming a tight bearing in the usual manner.

I is a gear or pinion fast on the shaft G, by which the latter is rotated, imparting a rotary motion to the hollow shaft D and to the arms F, which are secured to said hollow shaft at the drum E. The arms F, which may

be made of thin or sheet metal, are larger at that end which communicates with the drum E, and taper on all sides toward their outer ends or extremities. These arms F are triangular in a cross-section, (see Figs. 4, 5, 6, 7,) and are made with a narrow opening or slit all along their rear side, through which the blast escapes, and which is closed when the machine is at rest by means of a long flap-valve, *s*, which swings down over said opening in arm F, and which is kept open while the arms F are in motion by the escape of the blast or air from the arms, and also by their motion through the liquid mass.

O is a coarse wire gauze or grating, which is arranged in about a vertical plane, (one over each of the arms F ascending from their front or sharp edges,) the lower edge of which is fastened to the arm F, and the other edges to the supporting-rod *u*, which extends from the collar J fast on the hollow shaft D. This grating O is rotated with the shaft D and arms F, and serves to stir up and keep constantly agitated the mass of material. It will be understood that though I have shown the machine with two of these gratings, O, (one to each arm F,) their number may be increased if found expedient.

In lieu of the grating O any other form of stirring device may be attached to the rotating hollow shaft D to agitate the mass of material during the cooling process; or an agitator working independently of the shaft D and moving in an opposite direction may be employed.

The red arrows in the drawings indicate the directions of motion of the blasts or currents of air, and the black arrows the directions of motion of the parts of the machine.

The operation may be thus explained: The tank A being supplied with the mash (or other material) to be cooled, a blast is supplied by any suitable blowing apparatus to the pipe C, and motion is imparted to the driving-gear I, which causes the hollow shaft D to rotate, carrying with it the drum E, arms F F, and stirring gratings O. The arms F, it will be remembered, move in such direction (in a plane about parallel with the bottom of the tank) as that their sharp edges penetrate the mass of material, and they are thus enabled to move readily and also to more easily create a tendency to form a vacuum at their rear flat sides. As the arms F F and the agitators thus rotate in the mass of material the valves *s* are thrown open and the blast in the arms F F escapes through the long narrow slits in their rear sides and ascends through the mass of agitated material, being broken up into numerous currents, and being thoroughly disseminated through the mass of warm material, cooling by contact all its particles, after the same fashion as more fully set forth in my previous application for this process or method of cooling by discharging blasts of air into the material near the bottom of the mass and allowing it to escape upward through the mass while the latter is kept in a state of agitation. If the arms F were not provided with some means of closing their apertures when they were in a state of rest, every temporary stoppage of the machine would allow the mass of liquid material to fill into the said arms and drum E and shaft D up to the level of the material in the tank, and in restarting the apparatus all this material would have to be forced out of the air-spaces. This objection is, however, avoided by the use of the flap-valves S, which close the openings in arms F as soon as the rotary motion of the latter is checked.

It will be understood that the number and formation of the arms F may be varied, as well as the detail of construction of the other parts, without departing from my invention.

It will be observed that by carrying the blast down through a central shaft, D, and thence into the arms F, the whole structure is made very light and put into a simple and strong form. The capacity of the two (or whole number of) arms F should about equal the capacity of the hollow shaft D, and the capacity of the openings in the arms F for the escape of the blast should be in the aggregate a little less than the capacity of shaft D, so that the blast will escape with the proper force.

It may be found in practice that for some purposes of cooling a natural blast may be created by the rotation of the blast-pipe G sufficient to effect the cooling of the material. A blast may be thus created by discarding the stationary supply-pipe C and extending the rotating hollow shaft D in the direction shown in red lines and forming it with a spread mouth, as clearly illustrated in red at Figs. 2 and 3, to catch the air during its rotation.

It is obvious that numerous modifications may be made in the machinery shown and described without departing from the spirit of my invention.

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

1. The combination of blast or air conducting arms F with a supply-tube, D, and a tank for containing the material to be cooled, when the arms F are caused to rotate, as and for the purpose described, and are supplied in any way with a current of air.

2. Providing the openings through which the air passes into the mass of material with valves or gates, substantially for the purpose set forth.

3. Making the arms F thinner at their forward than at their rear edges, substantially as described.

In testimony whereof I have hereunto set my hand and seal this 7th day of November, 1863.

ADDISON SMITH. [L. S.]

Witnesses:
J. C. McINTIRE,
M. M. LIVINGSTON.