J. ADAIR.

Oil Condenser.

No. 35,497. Patented June 10, 1862.

Fig. 3.

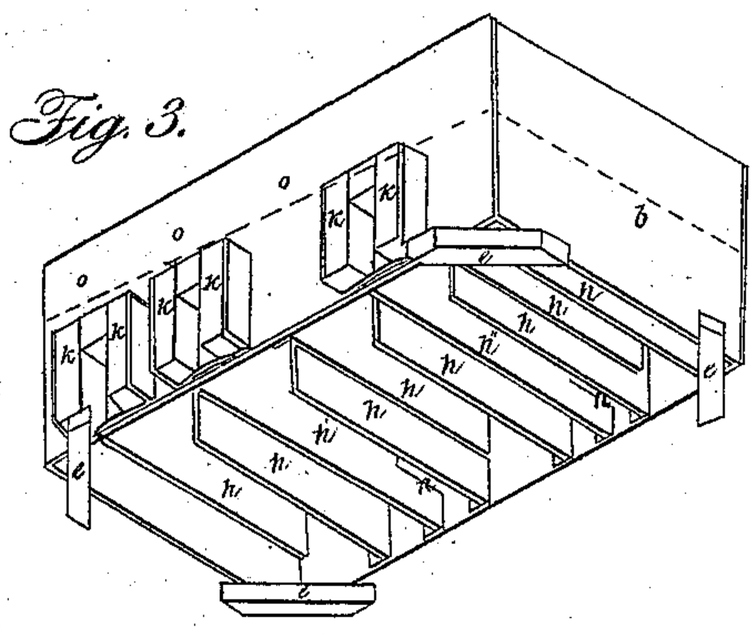


Fig. 2.

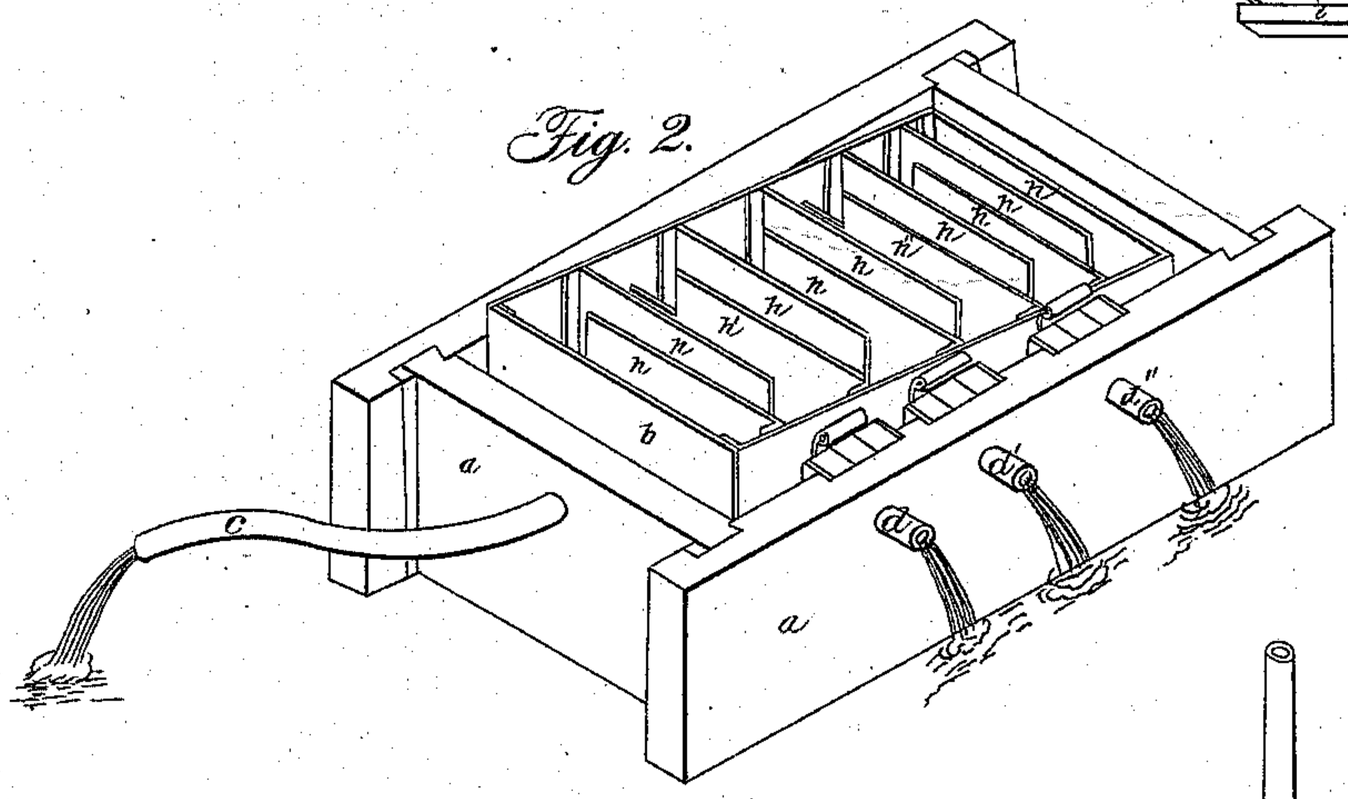
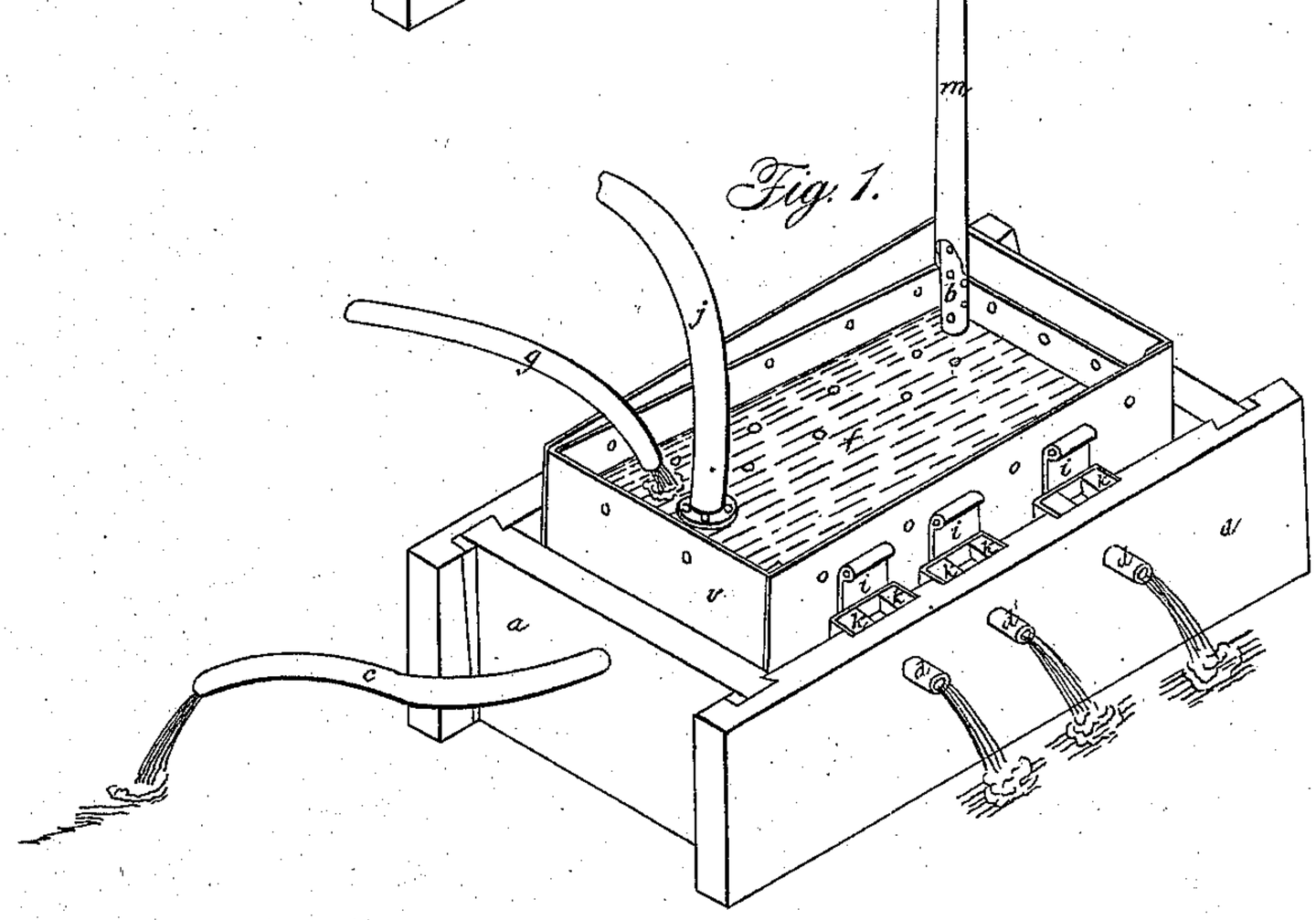


Fig. 1.



Witnesses:

W. Bakewell

W. G. Cushing

Inventor:

James Adair

UNITED STATES PATENT OFFICE.

JAMES ADAIR, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN CONDENSERS FOR OIL-STILLS.

Specification forming part of Letters Patent No. **35,497**, dated June 10, 1862.

To all whom it may concern:

Be it known that I, JAMES ADAIR, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Oil-Condensers; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a perspective representation of my improved condensing apparatus. Fig. 2 is a representation of my condensing apparatus, the top of the worm-chest being removed to exhibit the construction of its interior. Fig. 3 is a representation of the worm-chest removed from the water-tub, and seen from its under side.

In the several figures like letters of reference denote similar parts of the apparatus.

My invention is designed to simplify the construction and render more efficient the operation of condensers for the distillation of carbon oils in the process of refining, which contains the following principal features, viz: First, dispensing with the use of the ordinary worm of coiled pipe, which admits of the condensed oil being drawn off only at one end, and which cannot be readily cleaned; second, causing the oleaginous vapor to come in contact with the cold water as it passes through the condenser, by making the surface of the water one side of the winding passage through which the vapor is caused to pass; third, providing for the escape of any permanent gas or uncondensable vapor through a different aperture from that at which the condensed oil passes off; fourth, causing the permanent gas or uncondensed vapor to pass through a shower of cold water as it is escaping from the condenser, whereby much of the lighter vapor which would otherwise escape is condensed and returned to the condenser, to pass off in a different direction; and, fifth, providing for the escape from the same condenser at different points of the various grades of oil, benzine, &c., thus dispensing with the use of a series of condensers.

To enable others skilled in the art to construct and use my improved condenser, I will proceed to describe its construction and operation.

In the drawings, Figs. 1 and 2, *a* is a tub or vat in which the condenser or worm-chest *b* is placed. This tub *a* has an overflow-pipe, *c*, at one end, placed at the height designed to be the surface-level of the water in the condenser. It has also a series of oil-spouts, *d d′ d″*, at one side, through which the condensed oil, benzine, &c., escape from the condenser, the level of which is but a little higher than that of the overflow-pipe *c*. The worm-chest *b* is a rectangular box, of metal, wood, or other suitable material, rather shorter and narrower than the tub *a* in which it is placed. It is open at the bottom or under side, and rests in the tub on blocks *e e*, &c., (see Fig. 3,) which are placed in the bottom of the tub, so as to allow the water to pass freely from it into the tub. The top or upper side of the worm-chest is covered by a metallic plate, *f*, which is attached to the chest below the top of its sides, and is higher at one end than the other, so as to form on the top of the worm-chest a vessel into which the cold water is poured at its higher end from a pipe, *g*, as seen in Fig. 1, the sloping of the covering-plate *f* causing the water to run down to its lower end. The interior of the worm-chest is divided by partitions *h h*, &c., which extend at gradually-diminishing distances apart, alternately, from opposite sides of the worm-chest. Most of these partitions *h h* do not extend quite across from one side to the other of the worm-chest, but leave a space for the vapor to pass around their ends from one space between the partitions to another, thus compelling the vapor that passes through the condenser to traverse backward and forward or from side to side repeatedly in its course. Some, however, of these partitions (marked *h′* in Fig. 1) are continued all the way across from one side to the other of the worm-chest, but have a piece cut away from the upper corner, so as to allow the vapor to pass, but leaving the edge of the partition higher than the surface-level of the water in the worm-chest all the way across, so as not to permit the oil condensed on the surface of the water to pass beyond such partition. Each of these continuous partitions *h′ h″* (of which there may be as many as desired, depending on the size of the condenser) marks a division or section of the worm-chest, and each section is furnished with an outlet for the oil condensed and floating on the surface of the water within it. Each outlet in the side of the worm-chest is furnished with a valve or

gate, *i*, for closing the opening when desired, and is surrounded by a small wooden frame, *k*, which occupies the space between the side of the worm-chest and the inside of the tub, around the outlets in the worm-chest and around the oil-spouts *d d' d''* in the side of the tub. These frames around the outlets prevent the oil or condensed vapor from escaping into the tub around the worm-chest and cause it to flow out of the oil-spouts *d d' d''*, and avoid the use of a continuous pipe from the worm-chest, which would interfere with the removal of the worm-chest when desired. A piece of heavy cotton wick may be passed through the oil-spouts *d d' d''* and inserted into the worm-chest through the openings in its side to conduct the oil as it condenses through the spouts. The partitions in the worm-chest are closer together at its lower than at its upper end, in order gradually to reduce the width of the passages which the oil vapor traverses on its way through the condenser, and the sloping top or cover *f* makes the height of the spaces between the partitions above the water-level to be less at the lower than at the upper end for the same purpose. The main vapor-pipe *j* from the still enters and is attached to the cover *f* of the worm-chest at its upper or higher end, and at the lower end a short perforated pipe, *l*, or gas-trap rises from the cover *f*. This perforated pipe *l* is surrounded by a long pipe, *m*, of larger diameter than the perforated pipe *l*, and which does not quite touch the plate or cover *f*, so as to allow the water on top of the worm-chest to pass into the gas-trap through the perforations of the pipe *l*.

The apparatus thus described is susceptible of application to the condensation of vapor in distilling any other fluids which will not mix with water besides carbon oil, for which, however, it is particularly designed.

The operation of my improved condensing apparatus is as follows: The vat or tub *a* being filled with cold water to the level of the overflow-pipe *c*, and the worm-chest placed in it, with its open bottom downward and resting on the strips *e e*, &c., a few inches above the bottom of the vat, a stream of cold water is allowed to flow on the metallic top of the worm-chest *b*, through the pipe *g*. The vapor from the still is admitted into the top of the worm-chest through the main *j*. The partitions *h h*, &c., in the worm-chest form a continuous zigzag passage for the oil vapor, as seen in Fig. 2, the surface of the water in the worm forming the lower side of this passage, and the top or cover of the worm-chest forming the upper side of this passage. As the oil vapor enters the worm-chest at the upper end it passes backward and forward along the zigzag partition until it reaches the first continuous partition, *h'*. This partition extends entirely across the worm-chest, excepting at a point above the water-level, so that while the vapor yet uncondensed can pass through the aperture at *n*, Fig. 1, the condensed oil on the surface of the water cannot pass beyond that partition *h'*, but must, as it accumulates, flow out at the pipe *d*, the oil thus collected being that which most readily condenses. The vapor yet uncondensed passes on through the aperture *n* in the first continuous partition, *h'*, through the passage in the worm-chest until it reaches the second continuous partition, *h''*, where it passes through the aperture *n'* above the water-level, while the condensed fluid which has accumulated on the surface of the water in the worm-chest between the partitions *h'* and *h''*, not being able to escape otherwise, flows out at the second oil-pipe, *d'*. The remaining vapor and gas yet uncondensed proceeds through the remainder of the passage in the worm-chest, and as it condenses flows out of the third oil-pipe *d''*, while the permanent gas and uncondensed vapor, if any, rise through the gas-trap *l*, and in so doing meet the cold water entering the worm-chest in a shower through the perforations in the short pipe *l*, by means of which any vapor yet susceptible of condensation is returned to the worm-chest, while only the permanent gas escapes through the pipe *m* and is carried to any desired receptacle or allowed to pass off. Cold water is supplied to the condenser only through the gas trap or pipe *l*, and flows out at the overflow-pipe *c*, which may be inserted into the tub and curved downward, so as to keep its inner orifice continually below the surface of the water, and thus prevent the condensed oil from passing off in this direction.

The advantages of my improved condenser are that it is not as liable to get out of order as an ordinary coiled pipe or worm, and is more easily repaired; that by the continual flow of cold water over the top of the worm-chest and the passage of the oil vapor over the surface of the water and in actual contact therewith a more rapid and complete condensation is effected; that the permanent gas or uncondensed oil which would otherwise escape being passed through a shower of cold water there is more liquid product obtained by condensation, and that the permanent gas being caused to escape through a different aperture from that at which the condensed liquid is drawn there is less danger of the gas carrying off with it any condensable vapor, and that with the use of a single worm different grades of oil are extracted separately, varying according to their ease of condensation, and thus the heavier oils, the lighter oils, and the benzine are separated and removed from the condenser without probability of becoming readmixed.

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

1. The use of a worm-chest constructed substantially as described, immersed in a vat or vessel of water, for the purposes hereinbefore set forth.

2. Causing the oleaginous vapor to be condensed to pass through a zigzag passage, one side of which is a water-surface, in order to secure a more rapid condensation and to enable

the condensed fluid to be drawn off at different points, in the manner described.

3. So constructing the worm-chest of the condenser as to separate the different qualities of oil by partitions which the condensed fluid cannot pass, but which present no obstacle to the flow of the uncondensed vapor and gas through the worm, for the purpose hereinbefore set forth.

4. Admitting the cold water in a shower into the worm-chest at its rear end by a perforated pipe, through which the gas and uncondensed vapor are compelled to pass in their exit from the condenser, substantially as and for the purpose hereinbefore described.

In testimony whereof I, the said JAMES ADAIR, have hereunto set my hand.

JAMES ADAIR.

Witnesses:
M. G. CUSHING,
C. W. LEWIS.