2 Sheets—Sheet 1.

L. R. CORNELL.

PROCESS AND APPARATUS FOR DRYING FISH SCRAP.

No. 192,740. Patented July 3, 1877.

Fig. 1.

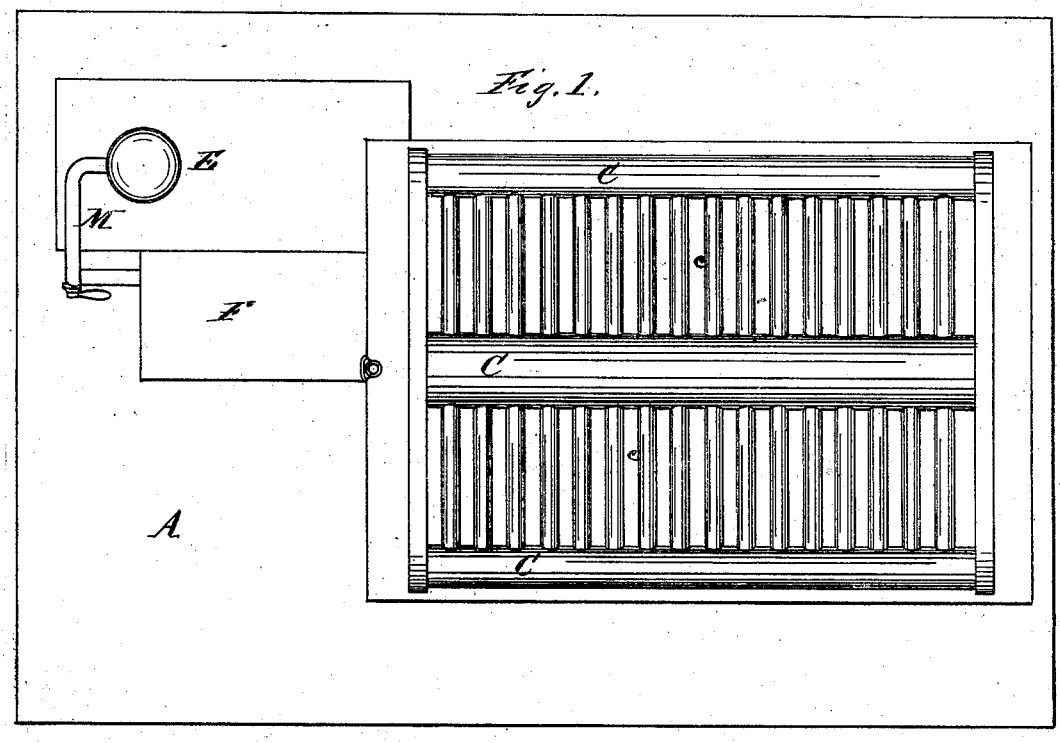
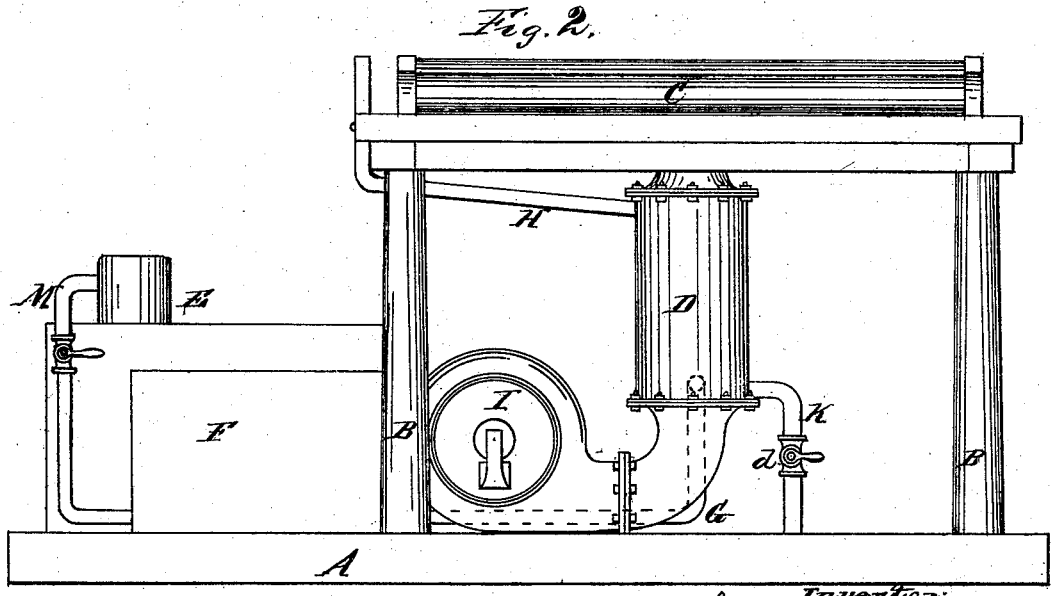


Fig. 2.



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2 Sheets—Sheet 2.

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PROCESS AND APPARATUS FOR DRYING FISH SCRAP.

No. 192,740. Patented July 3, 1877.

Fig. 3.

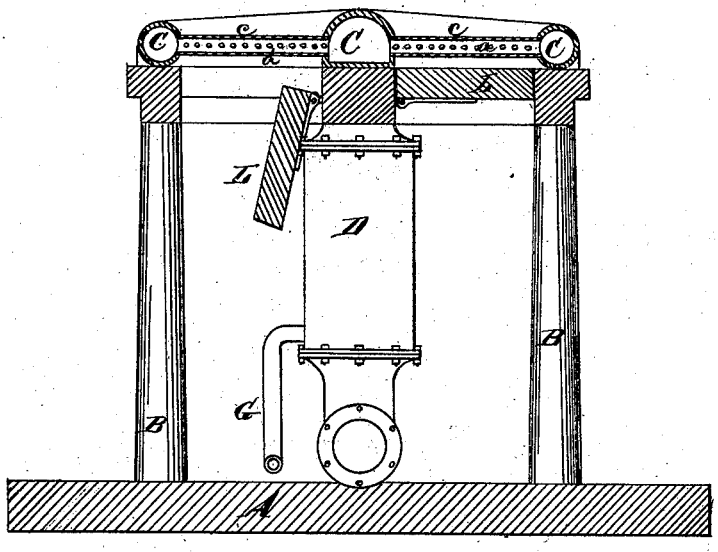
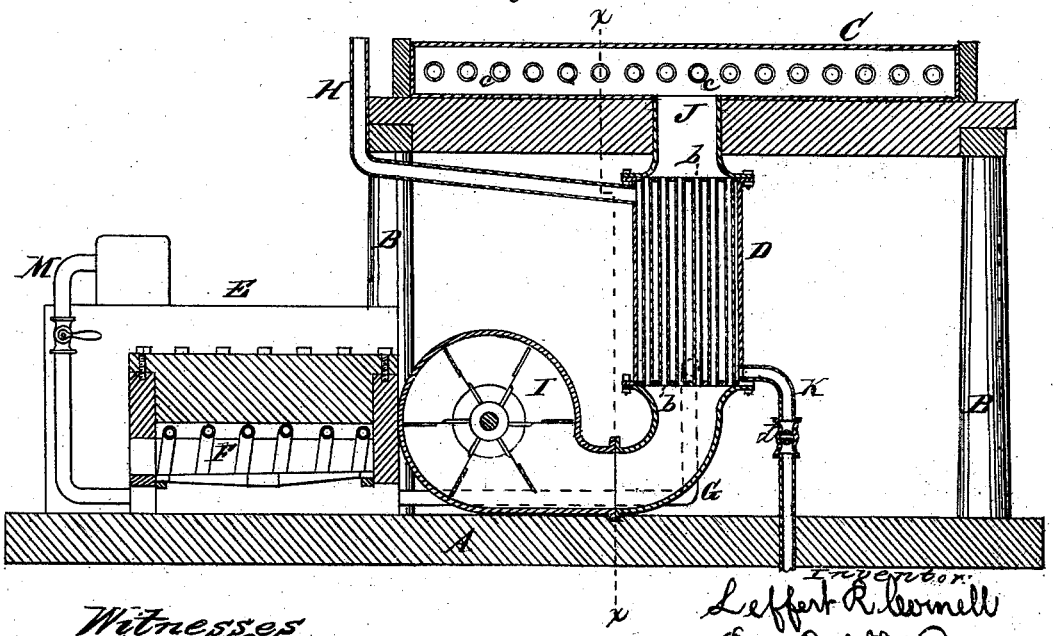


Fig. 4.



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UNITED STATES PATENT OFFICE.

LEFFERT R. CORNELL, OF SHELTER ISLAND, ASSIGNOR OF ONE-HALF HIS RIGHT TO HIRAM R. DIXON, OF CASTLETON, NEW YORK.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR DRYING FISH-SCRAP.

Specification forming part of Letters Patent No. **192,740**, dated July 3, 1877; application filed April 20, 1876.

To all whom it may concern:

Be it known that I, LEFFERT R. CORNELL, of Shelter Island, in the county of Suffolk and State of New York, have invented certain Improvements in Process and Apparatus for Drying Fish-Scrap and other Substances, of which the following is a specification:

The objects of the present invention are to provide an efficient process for the volatilization of and discharge from the fish-scrap or other substance to be similarly treated, in the operation of drying, of the oleaginous matters contained therein; and, also, in aid of said process, and as a part of the said invention, to provide an efficient apparatus for supplying and forcing highly-heated currents of air through and among the fish-scrap and other substances requiring similar treatment in the process of drying.

Heretofore fish-scrap has usually been dried by means of pipes heated by ordinary steam, which pipes were placed in revolving cylinders in which the fish-scrap was placed to be dried.

This mode of drying this material is subject to several objections, among which the large amount of time required for the work and the great expense involved in the operation are important, as affecting the cost of manufacture.

Another objection to this previously-practiced mode, as compared with that which I am about to describe, relates to the product, my invention being capable of volatilizing and driving off from the fish-scrap and some other substances those fatty matters which it is desirable and even important should be removed in the process of drying, and which the previous process and apparatus were incapable of furnishing or utilizing a sufficiently high degree of heat to eliminate, but which are volatilized and carried off by the highly-heated currents of air to which the substance is subjected by my process and apparatus.

One part of the said invention consists in volatilizing and removing from the fish-scrap or other material, in the process of drying, the oleaginous matters, or either of them, contained therein, by subjecting them to a current or currents of air heated to a degree adapted to accomplish that purpose, substantially as hereinafter set forth.

Another part of the said invention consists in the combination, with a blower and with a distributing apparatus adapted to discharge the air into the substance to be dried, of a heating-chamber and series of pipes, through which the air must pass in its passage to the distributing apparatus, substantially as hereinafter more fully set forth.

Another part of the said invention consists in the combination, with a blower, a distributing apparatus adapted to discharge and distribute the heated air into and among the substance to be dried, a heating-chamber, and a series of pipes therein, through which pipes the air must pass on its way to the distributing apparatus, of a superheater, substantially as hereinafter more fully set forth.

Another part of the said invention consists in the combination, with the apparatus for discharging and distributing the heated air into and among the substance to be dried, of a movable or downwardly-opening platform or floor arranged under said distributing apparatus, whereby the removal of the dried substance is facilitated, substantially as hereinafter more fully set forth.

Referring to the accompanying drawings, Figure 1 is a plan of my apparatus. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical transverse section, showing the parts at the right hand of the line *x x* on Fig. 4, and representing a section of the platform as swung down to allow the dried material to be discharged. Fig. 4 is a vertical longitudinal section through the center.

A represents the foundation of the apparatus, which may be the ground, the stone floor of a building, or any other suitable substructure. B B are posts which support the distributing-pipes C C and the small distributing-pipes *c c*, through which the heated air is received from other portions of the apparatus, and discharged and distributed into and among the substance or substances to be dried. For the purpose of so discharging and distributing the heated air, small perforations *a* are made in the sides of the pipes *c c*, through which the heated air is discharged.

It is important that the heated air discharged into the fish-scrap or similar substance to dry it shall be of sufficiently high temperature to volatilize and drive off the fatty matters contained therein, partly because they are injurious in the product, as among other things, endangering spontaneous combustion, and partly because they interfere with and delay the drying process itself.

I suppose the heat thus required and essential to this result cannot be less than 350° to 500° Fahrenheit, and I prefer to heat the air used for drying these substances to about 800° or 900° Fahrenheit, as about the most efficient degree of heat for the perfect and ready accomplishment of the purpose of my invention.

In the mode which I have adopted as the best for giving this heat to the air, and which is to a certain extent a part of this invention, I pass the air to be heated through a series of tubes, *b b*, inclosed in a heating-chamber, D, through which latter, and among the tubes, a current of superheated steam is made to pass.

For this purpose I take steam either from a steam-boiler, (indicated at E in the drawings,) or from the exhaust of the engine used about the works, (the latter being preferred for reasons of economy,) and lead it through a superheater, F, where it receives an intense heat, and from which it is conducted through a pipe, G, (shown principally in dotted lines in Figs. 2 and 4,) to the chamber D, through which and among the pipes or tubes *b b* it freely circulates, imparting a very high degree of heat to the air passing through the said tubes *b b*, and the cooled and uncondensed portion may be freely discharged through the open pipe H.

I is a fan-blower, which takes in external air and drives it through the tubes *b b*, where it is heated, as before stated, and is thence forced, through the tube J and the tubes C C and *c c*, into and among the substance to be dried, as already suggested. As in this process the air must necessarily be heated to a very high temperature in passing through the tubes *d d*, in order to render it efficient in expelling the oil from the scrap, and as the blower I must be run at a very high speed to supply the necessary amount of air, it is essential that the blower shall be arranged out of the current of heated air, or, in other words, that the heating-chamber shall be arranged between the blower and the points at which the air is discharged into the material to be operated upon in the line of the passage of the air used in the process; for if the blower were arranged in the current of the heated air, the very great heat of the latter would speedily render the blower inefficient.

K is a pipe, through which, by means of the stop-cock *d*, the water of condensation may, as it accumulates, be drawn off into the tank which supplies the boiler, or otherwise discharged.

L L are hinged platforms, placed immediately under the pipes *c c*, to support the fish-scrap or other substance while in the process of drying, said platforms or floors being so arranged that they can readily be removed or opened, so as to allow the dried substance to be conveniently discharged.

I find these platforms most convenient for use when made in sections about six feet square, and each section hung upon hinges to open downward when required, as indicated in Fig. 3. Each section may be held in the closed position, when necessary, by a hook pin or bolt, or other convenient means.

The fish-scrap or other material to be dried having been placed upon the pipes *c c* and the platforms L L, a strong fire is made in the superheater, so as to heat the steam received into it through the pipe M, or otherwise, to a very great heat, and this steam, passing through the pipe G into the chamber D, gives a high heat to the tubes *b b*, which, in their turn, impart the necessary heat to the air which is being driven through them by the blower I, which is put in rapid operation for that purpose.

The degree of heat which I have mentioned at which the air is discharged into the fish-scrap volatilizes and carries off with the steam whatever fatty matters may be contained in said scrap, and the drying process, so relieved, is accomplished in a fraction of the time required by the old methods of drying by the low heat derived from unsuperheated steam, which was insufficient to volatilize and carry away these oily matters.

These fatty substances being removed, the drying is also more perfectly accomplished than could otherwise be done, and the dried article is at once ready for shipment, instead of requiring, as by the old process, to be exposed to the air in thin layers for some days to complete the drying and avoid spontaneous combustion.

When the fish-scrap has been sufficiently dried, the platforms are let go and the dried material discharged, and new and fresh material being supplied, the process may be repeated indefinitely.

It is possible that some modifications might be made in the process or apparatus I have described without substantially changing the result or departing from my invention—as, for example, it may be that the series of small tubes *b b* might be sufficiently heated in a reverberatory or other furnace constituting a chamber around them, instead of in a chamber heated by the introduction into it of superheated steam; but the modes and apparatus I have described I have tried, found efficient, and deem the best.

I claim as my invention—

1. The volatilizing and removing from fish-scrap and other substances requiring similar

treatment, in the process of drying, the fatty matters contained therein, by subjecting them to highly-heated currents of air, substantially as hereinbefore set forth.

2. The combination of the hot-air pipes C C *c c* and movable platforms L, substantially as hereinbefore set forth.

3. The combination of the pipes C C *c c*, series of dividing and heating pipes or tubes *b b*, and heating-chamber D, substantially as hereinbefore set forth.

4. The combination, in a drying apparatus, of the following instrumentalities, viz: a blower, a series of tubes, *b b*, to divide the air and impart heat to the small streams thereof passing through them, a heating-chamber containing the said tubes, and a series of distributing-tubes, *c c*, to discharge and distribute the heated air into the substance to be operated upon, said heating-chamber being arranged between the said blower and the said distributing-tubes in the pipe through which the drying-air is conveyed, substantially as hereinbefore set forth.

5. The combination of a blower, a series of tubes, *b b*, a chamber, D, a steam-generator, and a superheater, substantially as hereinbefore set forth.

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Witnesses:

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