

(No Model.)

S. E. WORRELL.

MACHINE FOR DRYING AND COOLING GRAIN AND OTHER SUBSTANCES.

No. 256,940.

Patented Apr. 25, 1882.

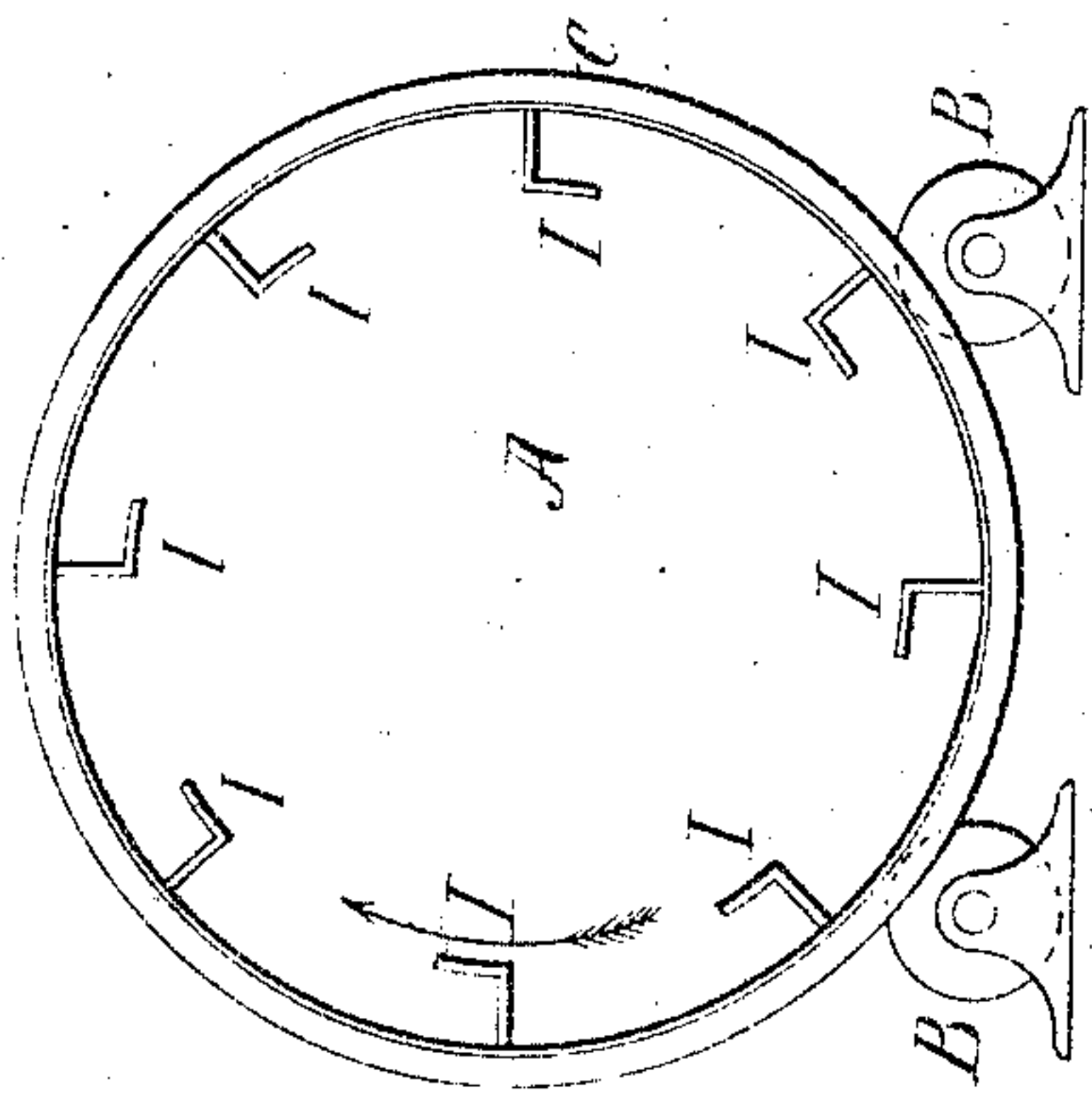


Fig. 1.

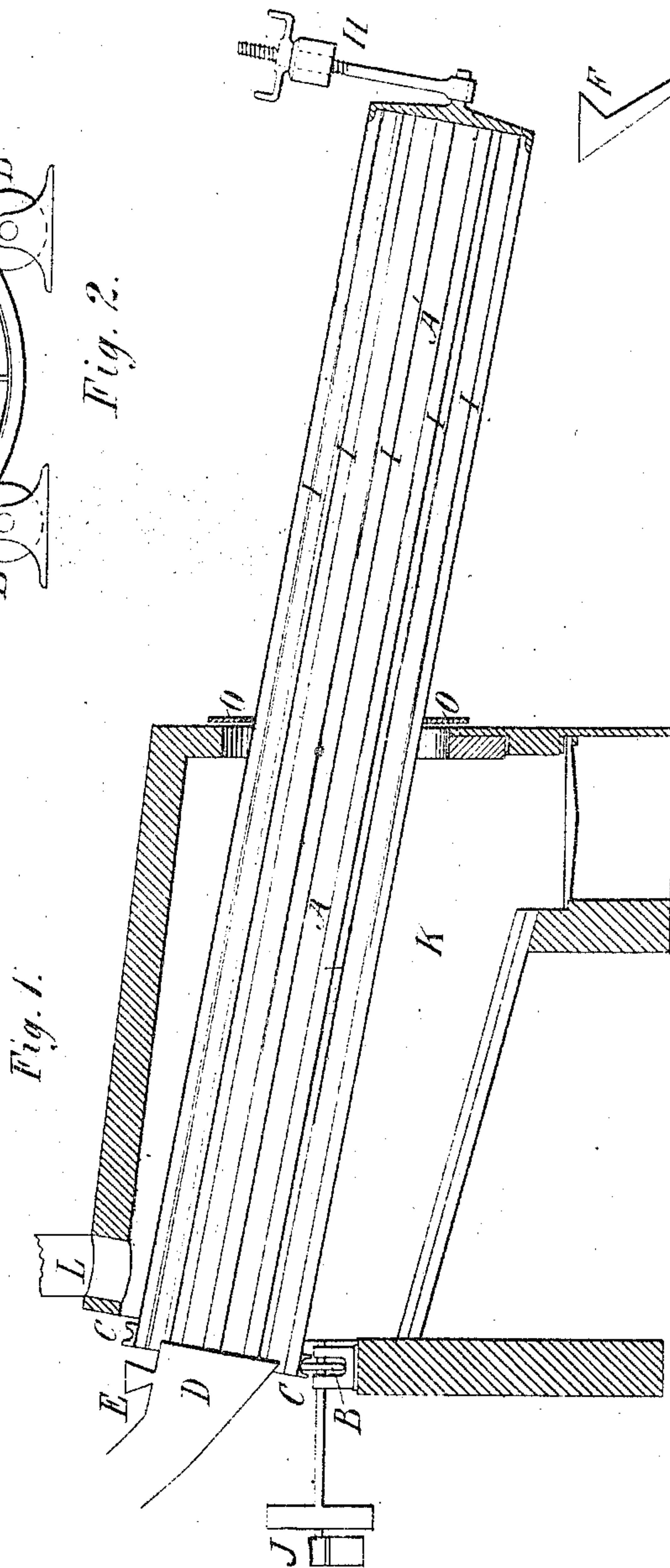


Fig. 2.

Witnesses.

Emil B. Nichols
L. R. Anderson

Inventor.

Stanley E. Worrell

UNITED STATES PATENT OFFICE.

STANLEY E. WORRELL, OF HANNIBAL, MISSOURI.

MACHINE FOR DRYING AND COOLING GRAIN AND OTHER SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 256,940, dated April 25, 1882.

Application filed November 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, STANLEY E. WORRELL, a citizen of the United States, residing at Hannibal, in the county of Marion and State of Missouri, have invented a new and useful Machine, of which the following is a specification.

My invention relates to improvements in machines for drying and cooling grain and like substances in one and the same operation. All drying-machines for this purpose, as constructed and operated heretofore, deliver the material being dried in a warm or hot condition, which is very objectionable, or require additional or separate machinery to rehandle and cool it, for it cannot be stored in bulk until thoroughly cooled, on account of the danger of spoiling by heating, and thereby becoming musty. The object of my invention is to overcome the expense and trouble of this additional machinery and labor heretofore required for cooling the grain or like substance being operated upon by producing a single machine which performs both of the usually separate operations of drying and cooling by one passage of the material through it, thereby effecting great economy over the former process.

I am aware that my invention somewhat resembles the drier for which Gibbs and Borwick obtained Letters Patent No. 134,659, January 7, 1873, but is quite different in construction and operation in the following points: First, my inclined revolving metal case extends beyond the furnace for cooling purposes; second, none of the bearings and journals of my device are exposed to the heated products of combustion, as a number are in the invention cited, which must make lubrication of these parts difficult, thereby increasing the friction and causing the rapid destruction of the machine; third, my invention, being less complicated, is easier to operate and not so liable to get out of repair; and, fourth, the Gibbs and Borwick principle of drying differs from mine in the fact that they bring the material operated upon into immediate contact with the heated gases of combustion, thereby tainting and spoiling it for food if it is grain, seeds, hominy, or other substance of an edible nature. In my improvement the current of air used for this

purpose is only heated by contact with hot metal surfaces. Consequently it contains no impurities to injure the dried product. Their device is evidently intended for drying cement, sewage precipitates, clay, and like sticky matters. Mine is not applicable to materials of that nature, nor is it claimed to be.

My invention consists of the apparatus hereinafter described, and illustrated in the accompanying drawings, in which arrangement the materials to be dried and cooled are caused to pass through an inclined revolving metal cylindrical case, the upper part of which is surrounded by a furnace. To the inside surface of this case are secured the troughs or caps to lift and agitate the substance being operated upon, and a current of air is drawn or forced through it to complete the operation.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is vertical longitudinal section of a device embodying my invention, and Fig. 2 is an enlarged end elevation of important parts of the same.

The metal case A A is supported at its upper end by the strong friction-wheels B B, upon which it revolves, and is kept in place by the groove C C. Motion is transmitted to it through the friction-wheels B B by gears or pulleys at J, or by common or worm gearing directly attached to the outside of this cylinder A A'. The lower end is supported upon friction-wheels that can be raised or lowered, or by a spider journaled into the screw H for the same purpose. The metal caps or troughs I I I are secured to the inside surface of this case A A', and I do not limit myself to the size or number of them, but put in what are required. The flat loose ring O O covers the opening left in the furnace K when the lower end of the cylinder or case is raised or lowered, preventing the entrance of too much cold air into the furnace. The suction-spout D is also surrounded by a ring attached to the end of the cylinder for the same purpose. The feeding-hopper E opens into the suction-spout. F is the delivery-spout. The products of combustion in the furnace K escape through the stack L.

The operation of my invention is as follows: After the furnace K has become sufficiently

hot, motion is applied to the cylindrical case A A' through the friction-wheels B B, and suction created in the spout D, causing a current of air to pass entirely through the case from the lower to the upper end. The grain or other material to be dried and cooled is continuously fed through the hopper E and spout D into the upper end of the case A, which is inclosed by the furnace K, where it becomes gradually heated by coming into contact with the hot metal surface. The drying process is now accelerated by the cups or troughs I I I, which carry it up and slowly empty themselves as the case revolves, thereby bringing every part of the material operated upon into frequent contact with the current of air heated by contact with the inside surface of the case A, also thoroughly mixing it and preventing it becoming scorched. Owing to the rotary motion and inclination of the cylinder, the drying material is constantly moving along toward the lower or delivery end. As soon as it has passed through that part inclosed by the furnace the cooling part of the process is commenced by the cool metal surface, assisted and completed by the current of air, which here has either a natural or an artificially-produced cold temperature. Finally, the material is discharged into the spout F in a dry and cool condition, fit for immediate storage in bulk, packages, or consumption. The delivery end of the cylinder or case is raised or lowered by the screw H, or by other means hereinbefore mentioned, to decrease or increase the speed of the process.

To cool naturally-heated grain, seeds, and material of a like character with this invention, the operation is the same as above, except the heat in the furnace is omitted.

I do not limit myself as to what shall be the exact portion of the case surrounded by the furnace or heating-chamber, but vary this ac-

ording to the requirement of the material operated upon; neither do I restrict myself to an exact cylindrical form of the case A A'. It may be made octagonal, fluted, or of similar shape, if deemed best. My apparatus can be constructed so as to utilize the waste heat from boiler and other furnaces, and instead of drawing the current of air through the spout D, it may be forced into the lower end of the case A A' without departing from the principle of my invention.

My improvement hereinbefore described is adaptable for drying and cooling damp grain, seeds, berries, fruit, brewers' grains, and other substances which are not of a sticky nature. It is also applicable to the cooling of grain, seeds, and other agricultural products which have spontaneously heated from being stored in bulk while containing a little moisture.

Having fully described my invention, what I desire to claim and secure by Letters Patent is—

1. In a drying and cooling device, the combination of the inclined revolving metal cylinder or case containing cups or troughs and partly inclosed or surrounded by a furnace or heating-chamber, with the means of producing a current of air, and appliances for varying the inclination of said cylinder and rotating it, substantially as described.

2. In a drying and cooling device, the combination of the inclined revolving metal cylinder or case containing cups or troughs and partly inclosed or surrounded by a furnace or heating-chamber, and appliances for varying the inclination of said cylinder and rotating it, substantially as described.

STANLEY E. WORRELL.

Witnesses:

L. R. ANDERSON,
E. R. NICHOLS.