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Patented Jan. 28, 1902.

G. A. LOWRY.

PROCESS OF FORMING BALES OF FIBROUS OR OTHER MATERIALS.

(Application filed Jan. 10, 1900.)

(No Model.)

Fig. 1.

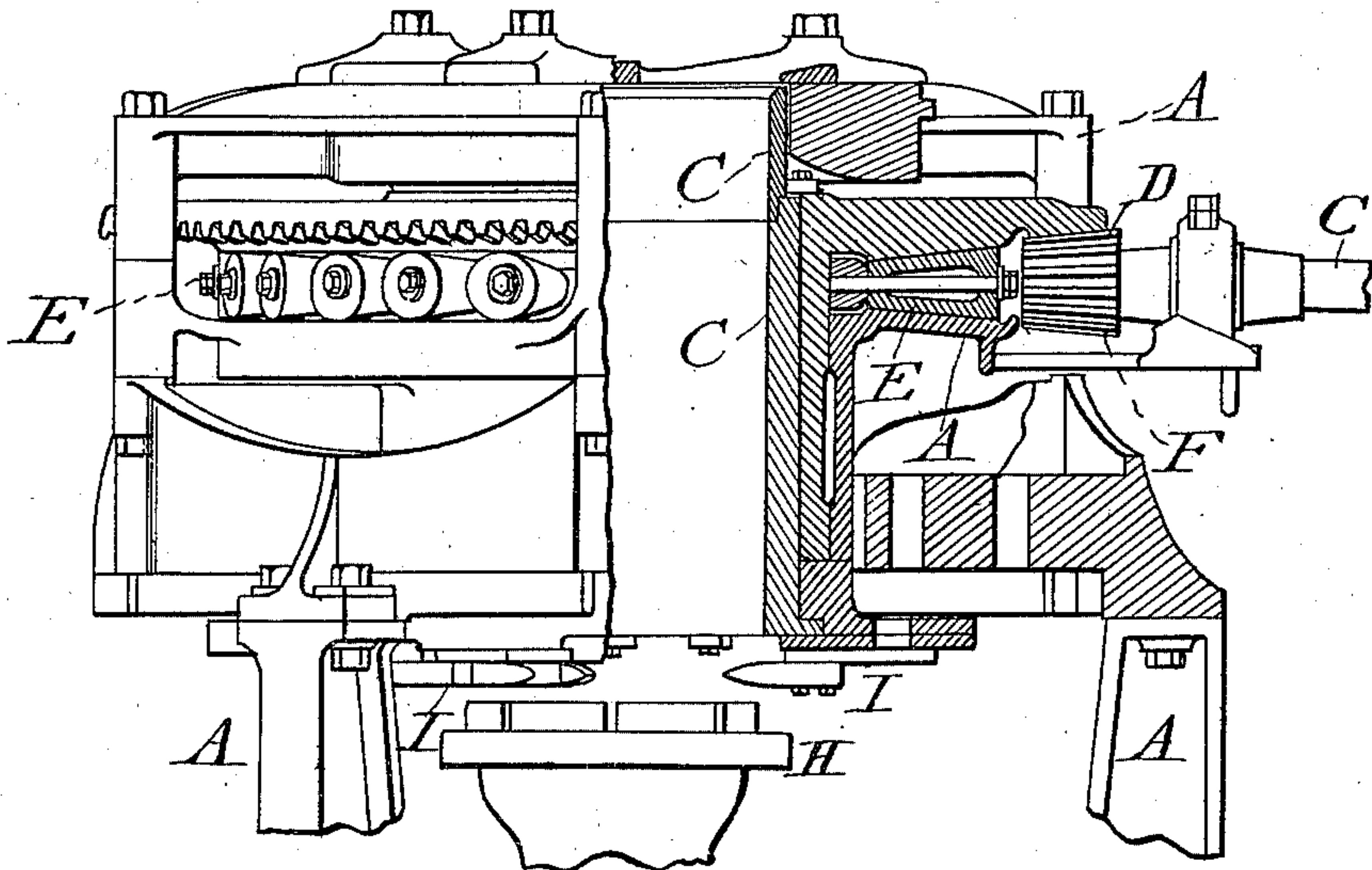


Fig. 2.

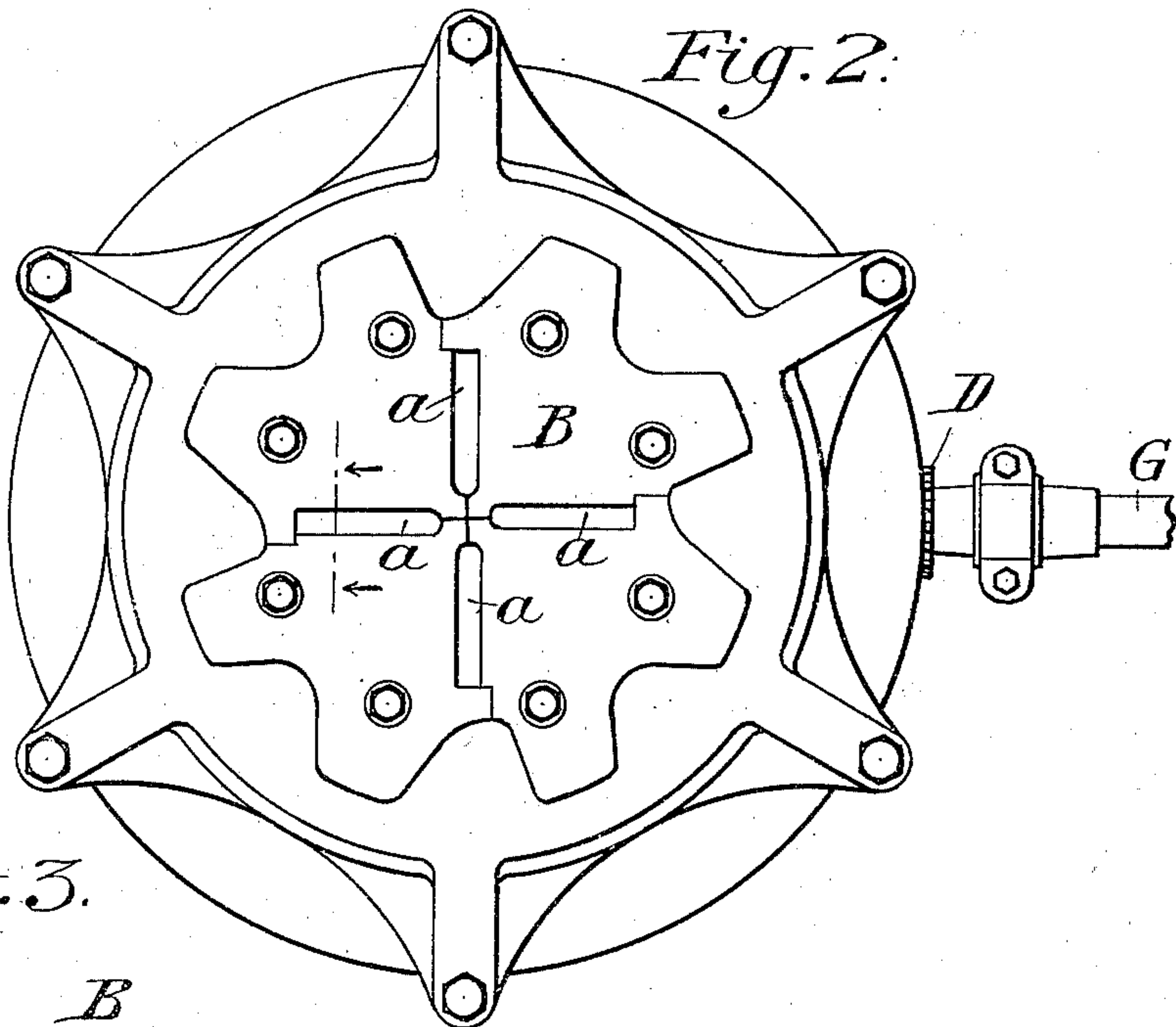
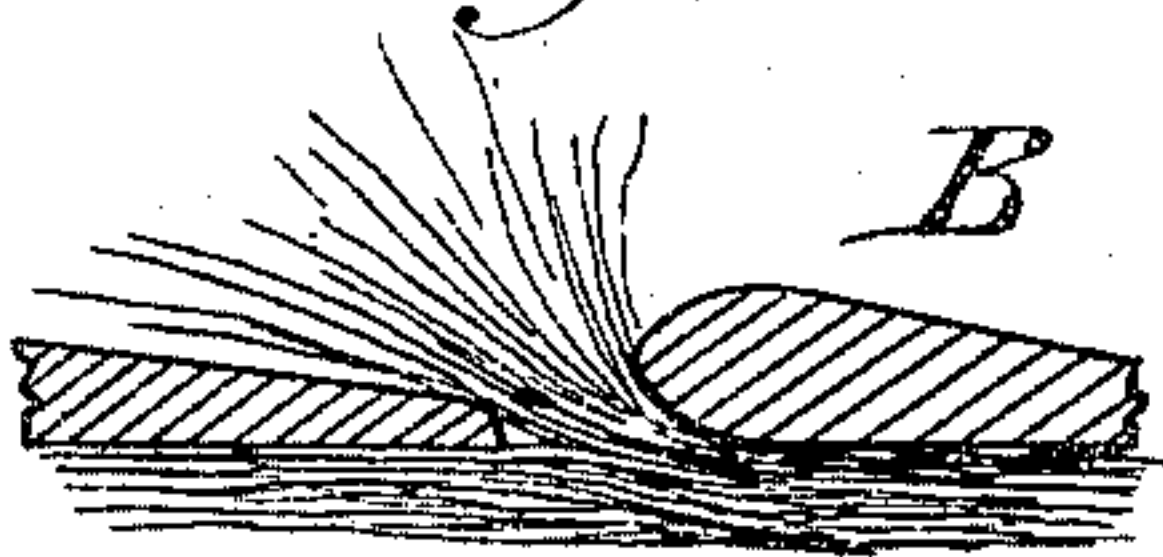


Fig. 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

GEORGE A. LOWRY, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE PLANTERS COMPRESS COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF WEST VIRGINIA.

PROCESS OF FORMING BALES OF FIBROUS OR OTHER MATERIALS.

SPECIFICATION forming part of Letters Patent No. 691,953, dated January 28, 1902.

Application filed January 10, 1900. Serial No. 974. (No specimens.)

To all whom it may concern:

Be it known that I, GEORGE A. LOWRY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Process of Forming Bales of Fibrous or other Materials, of which the following is a specification.

This invention relates to the process of preserving in the natural state and practically sterilizing hay, fodder, and various other materials.

The invention consists, substantially, in the method as hereinafter described, and more particularly pointed out in the succeeding claims.

The drawings accompanying this specification are used to illustrate one form of apparatus which may be advantageously employed in carrying out the process, but which of course is not the only apparatus capable of carrying out the method.

Like letters designate similar parts in the several figures of the drawings, in which—

Figure 1 is a side elevation, partly in vertical section, of an apparatus adapted to carry out the process. Fig. 2 is the top or plan of such an apparatus. Fig. 3 is a sectional view of the cap-plate or a portion of the same, while the material is being fed through slot in same.

It has been the effort of many persons for a number of years by the use of silos and other methods to preserve the natural juices in hay, fodder, and other materials capable of being fed to horses, cattle, and other animals, whether such material is cured or partially cured or green, and the present invention has in view the accomplishment of this same object in an efficient, simple, and economical manner. According to the present process the material to be preserved has the air contained in its interstices, or involved in the stems or fibers, or in the substance of the material itself, or between the fibers and layers of such fibers wholly or practically removed during the operation of producing the package or bale, and by pressing, rubbing, and, figuratively speaking, ironing out successive layers or small portions of the mate-

rial and retaining such layers under pressure while they are superposed one upon another, and the package or bale is thus being built up, and as an additional and advantageous step in the process the material while the package is being built up is subjected to such a degree of heat that its natural juices are in a measure cooked—that is, heated to a point which destroys the harmful bacteria. It has been found that many packages or bales of hay, fodder, or similar material, after being formed deteriorate by sweating or fermenting or having formed therein destructive molds and bacteria. These molds, ferments, and bacteria have their development promoted by the presence of air, and when this air is expressed and kept out of a package in the manner stated and hereinafter explained the evil effects above referred to will be largely prevented, and if additionally such material is subjected to such a degree of heat while the package is being formed as to practically destroy the destructive bacteria preservation of the package is insured.

In carrying out the process a variety of apparatus may be employed; but the press shown and described in my application for patent, Serial No. 725,279, filed July 27, 1899, with slight modifications, such as reducing the number of slots in the cap-plate and increasing speed of operation, constitutes the best form of apparatus which up to this time I have devised for the purpose, and such apparatus has been found most satisfactory and efficient.

It is evident that a small amount of material may be highly compressed more readily and have air expressed from its interstices more completely than can be done when a large quantity of such material is subjected to compression in bulk and the press or form of apparatus illustrated in the accompanying drawings is adapted to carry out this principle and build up a package or bale of layers each composed of a small quantity of such material and to subject the layers to continued pressure, so that the air which has been expressed cannot return to or reënter the fibers or get between the layers thereof while the package or bale is being formed or

being built up. At the same time the friction produced between the material being built up and the cap-plate generates sufficient heat to sterilize such material and, so to speak, cook these natural juices. This press produces a column of material composed of spirally-laid highly-compressed layers superposed one above the other, with the air expressed from the particles of material, from the interstices between such particles, and from between the layers of particles, and when the number of layers reach the proper vertical length the package or bale is given the permanent fastening while still under pressure, so as to practically seal the same and permit of its being transported and preserved in the compressed state to which it was originally subjected.

In the drawings reference-letter A designates the framework of the apparatus, which framework includes the top ring, forming the support of the slotted cap-plate, which latter is designated by reference-letter B. This slotted cap-plate is secured to the ring and provided with a series of slots *a*, through which the material is to be fed. The illustration of the manner in which the material passes through the slot is given in Fig. 3, and the preferred form of this slot is also shown in this figure of the drawings. In this connection it is to be noted that preferably and as shown the top surface of the cap is inclined toward the slot, and the under surface of the edge of the slot in the direction of the feed is inclined away from the opposite edge of this slot, so as to provide a throat through which the material may pass and in which it may be squeezed, as hereinafter described. A chamber C underneath the cap-plate is provided, and as the material passes through the slots it enters this chamber. The cap-plate and chamber should have relative rotation—that is, one or the other should be rotated—and in the construction shown in the drawings the chamber is rotated. This rotation is effected by means of suitable gearing or otherwise, and in the drawings the chamber is shown as having secured to it a horizontal extension provided on its under surface with a circular rack D.

The driving-shaft G has secured to it a pinion F, which engages the circular rack above referred to. Antifriction-rollers E may be interposed between the supporting-flange of this chamber and the frame of the machine. The chamber is preferably provided with a lining, and it extends, together with its extension, up close to the under side of the slotted cap-plate.

At the commencement of the operation of the machine material is introduced into the chamber and forced up against the under side of the cap-plate in any suitable manner—as, for instance, by interposing a cylinder of wood below such material and between the same and the plunger of a hydraulic jack H. With the relative rotation then being given

the cap-plate and chamber particles of material within the chamber will become interlaced and entangled with the fibers of the material being at the time introduced through the slots, and thus such material being introduced will be drawn into the chamber in a thin layer and as it enters will be subjected to a sort of ironing-out process—that is, it will be pressed against the under side of the lip of the slotted cap-plate and the air squeezed out of the particles of such material and from between such particles, and the layer of compressed material thus formed will be drawn farther into the chamber and laid spirally upon the subjacent material, thus at the same time forcing down such subjacent material farther into the chamber. This operation is continued until a column of superposed spiral layers of a sufficient length to form a bale or package is produced, and then this bale or package may be severed or separated from the material being fed into the chamber by knives I, such as are described in my prior application, and then the compression operation may be repeated. It is preferable, however, to continue this operation until a column of double the length of the bale desired is produced, and then to sever a length of such column sufficient to form a bale and leave within the chamber the upper portion of such compressed column, which upper portion will in turn act in place of a plunger or other device as an abutment, so to speak, to bear against the under side of the cap-plate and continue the ironing-out operation upon each layer as it enters the chamber and at the same time by its friction against the cap-plate generate the heat to degerm the material.

In the ordinary operation of my press for baling cotton the cap-plate has eight (8) slots, and the chamber is given about fourteen revolutions per minute. With such construction and arrangement the material is not heated, because the number of slots introduces such a frequent supply of the fresh material that there is not time to heat any particular layer; but according to the present process the slots should be decreased, and, as shown, four is found to be a convenient number, and the number of revolutions per minute of the cylinder should be increased, and it has been ascertained that eighteen (18) revolutions per minute will be effective. With this lesser number of slots and greater number of revolutions the friction of the material within the chamber against the under side of the cap-plate generates sufficient heat to cook the natural juices in such material as contains such juices, and thereby sterilize the same, and in any other material which is not furnished with natural juices to destroy the bacteria which may be present in the material, and thus sterilize it. It has been found that with hay 160° to 225° Fahrenheit is a sufficient heat to effectively perform the function desired; but of course with other materials the degree of heat must be varied according

to the material employed. It is evident that by reducing the number of slots greater heat will be generated and likewise that by increasing the speed of the machine additional heat will be created, and therefore the number of slots and the number of revolutions of the cylinder must be regulated by the constructor, according to the use to which the machine is to be put, or rather according to the material which is to be subjected to the process. The material having been formed and compressed into a column in the manner stated and gradually forced by additional increments or layers through the chamber is, when the apparatus shown in the drawings is used, caused to project beyond the lower end of such chamber until a sufficient length is exposed to form a package or bale, and then such length is severed by knives I, which will be projected into such material at the proper time and by suitable mechanism, as set forth in said former application. The severed portion of the column of material which is to form a package or bale must still be held under compression, both at its top and bottom, so that the air which has been expressed may not be permitted to return, or, in other words, so as to effectually seal the package or bale. This sealing of the package or bale against the entrance of air is believed to also be an important feature of the invention. The severed portion of the column rests upon a suitable bale-base supported upon the upper end of a hydraulic jack H, which prevents the package from expanding both during the compression operation and until it can be secured for the purpose of removal from the machine.

It is to be understood, of course, that after the package or bale has been severed it is wired or otherwise permanently fastened, so as to prevent any substantial expansion of such material during transportation or while awaiting consumption. These wires or similar fastening devices are of well-known construction and need not be particularly mentioned herein.

It has been found in practice that while a high degree of compression of the layers of the material should be always obtained to secure the best results, yet the degree of compression may be to some extent varied without destroying the utility of the process. In practice it has been found that a package or bale which has been compressed in layers until the package has an average density of fifty pounds to the cubic foot is quite satisfactory and efficient for the purpose intended.

The process may be applied with advantage to a large number of materials and substances, all of which it would be impracticable to enumerate in this specification. Some of these substances, however, are included in the following statements: the various grasses, the many species of clover, alfalfa, vetches, rapes, milletto, vines or straws of peas, beans, and other leguminous plants, the straw of grains,

the stalks of corn, the fodder made from the various grains cut before maturity, the various forms of sorghum, kaffir, broom-corn, sugar-cane, the leaves and pulps and refuse of beets, turnips, cabbages, and other vegetables, the leaves left from the canning or treatment for commercial use of green vegetables, malt sprouts, and brewer's grains, hulls and chaff of rice, cotton-seed, and other grains, whether these substances are dried or partially cured or green or whether they are in a complete state or shredded or divided or otherwise treated.

In addition to utilizing the process for preserving foodstuffs for cattle or persons it may be also advantageously employed in sterilizing various materials which are liable to contain infection, such as rags shipped from foreign countries. It has also been found with this process certain animal-foods are improved by bringing out the aroma ordinarily suppressed by the dry state of the material. It is believed that the heating and crushing and rubbing of the fibers tend to soften them, and thereby make them more palatable and at the same time permit the aroma to come to the surface, and thereby make the fodder more appetizing to the animal. It has also been found that by this process what is known as a "balance ration" may be produced and preserved in its effective state—that is to say, a package produced by the process will comprise a combination of hay or other coarser forage and ground material—and the deterioration of this composite food will be prevented by the exclusion of air and the destruction of the bacteria caused by the method of making the product.

When materials are particularly dry, moisture may be applied to them either during compression or before the compression, and such moisture will by the heating part of the process be converted into steam and become of assistance in sterilizing and softening the material.

It is manifest that variations may be made in the operations described for carrying out the process and slight details in the manner of operating, and I do not, therefore, wish to be understood as limiting myself to the exact details shown and described.

I do not claim herein the product described, as the same is set forth and claimed in my pending application, Serial No. 975, filed January 10, 1900.

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

1. The process which consists in forming fibrous or other material into practically continuous sheets or layers, and separately expressing the air from each thin sheet or layer and simultaneously applying thereto a high degree of heat, and finally superposing such compressed sheets or layers upon each other under compression.

2. The process which consists in forming green fibrous material into practically contin-

uous thin sheets or layers and expressing the
air separately from each sheet or layer, and
simultaneously therewith subjecting such
sheet or layer to a high degree of heat to steril-
5 ize the same, and superposing such com-
pressed sterilized sheets or layers upon each
other under compression, and finally securing
the package formed by the superposed sheets
or layers while still under compression to seal
10 the same against admission of air, as and for
the purpose set forth.

3. A process of forming bales of fibrous ma-
terial, which consists in forming the material

into layers and highly compressing each indi-
vidual layer so as to express the air from the 15
particles thereof, and to flatten the same and
simultaneously applying heat to such indi-
vidually highly compressed and flattened
layer to sterilize the same, and finally super-
posing said layers under compression upon 20
each other and securing the same, as and for
the purpose set forth.

GEORGE A. LOWRY.

Witnesses:

FRANK T. BROWN,
J. F. O'SHAUGHNESSY.