

A. EDWARDS.
Apparatus for Preparing Fertilizers.
No. 229,876. Patented July 13, 1880.

FIG. 1.

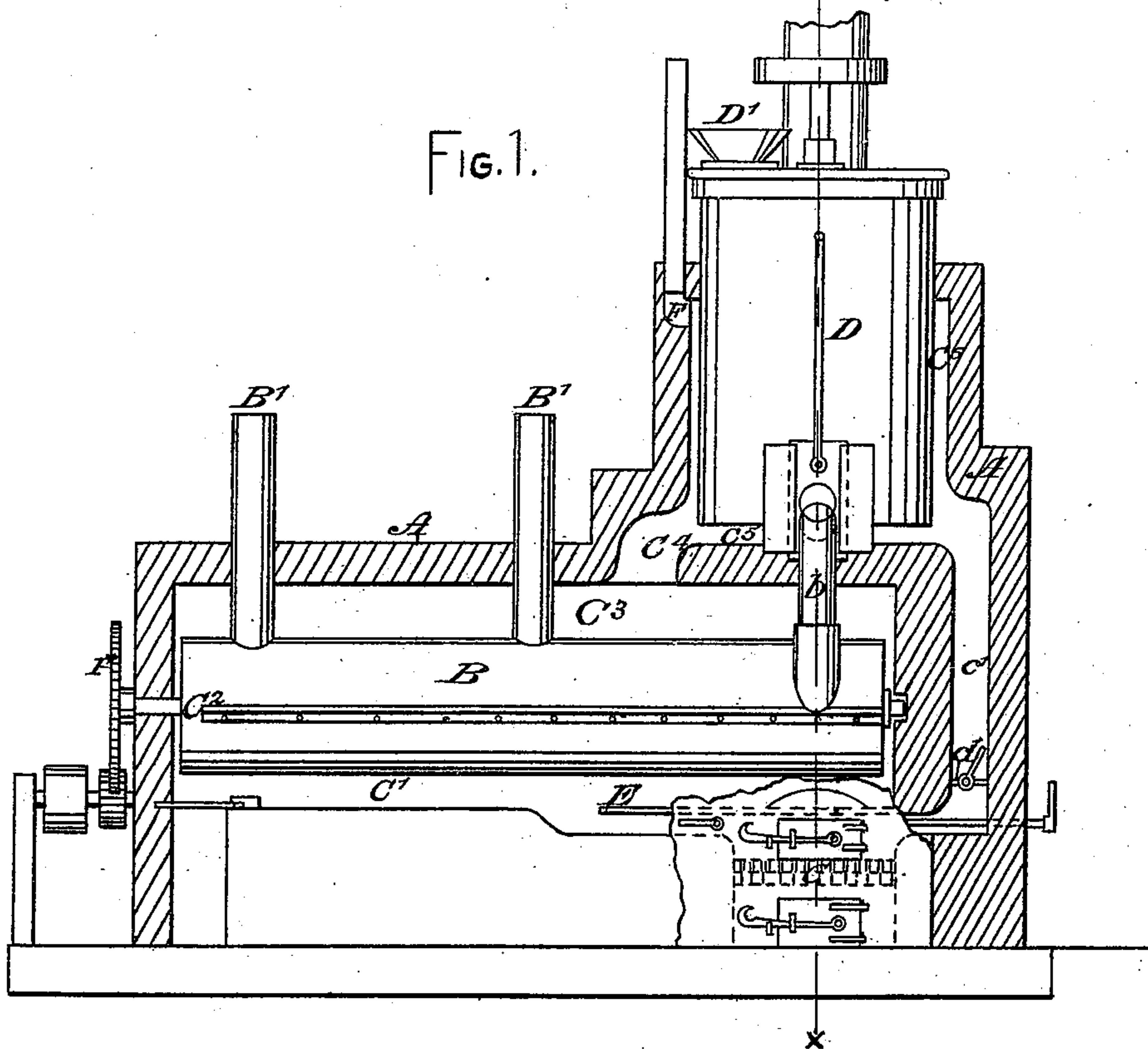
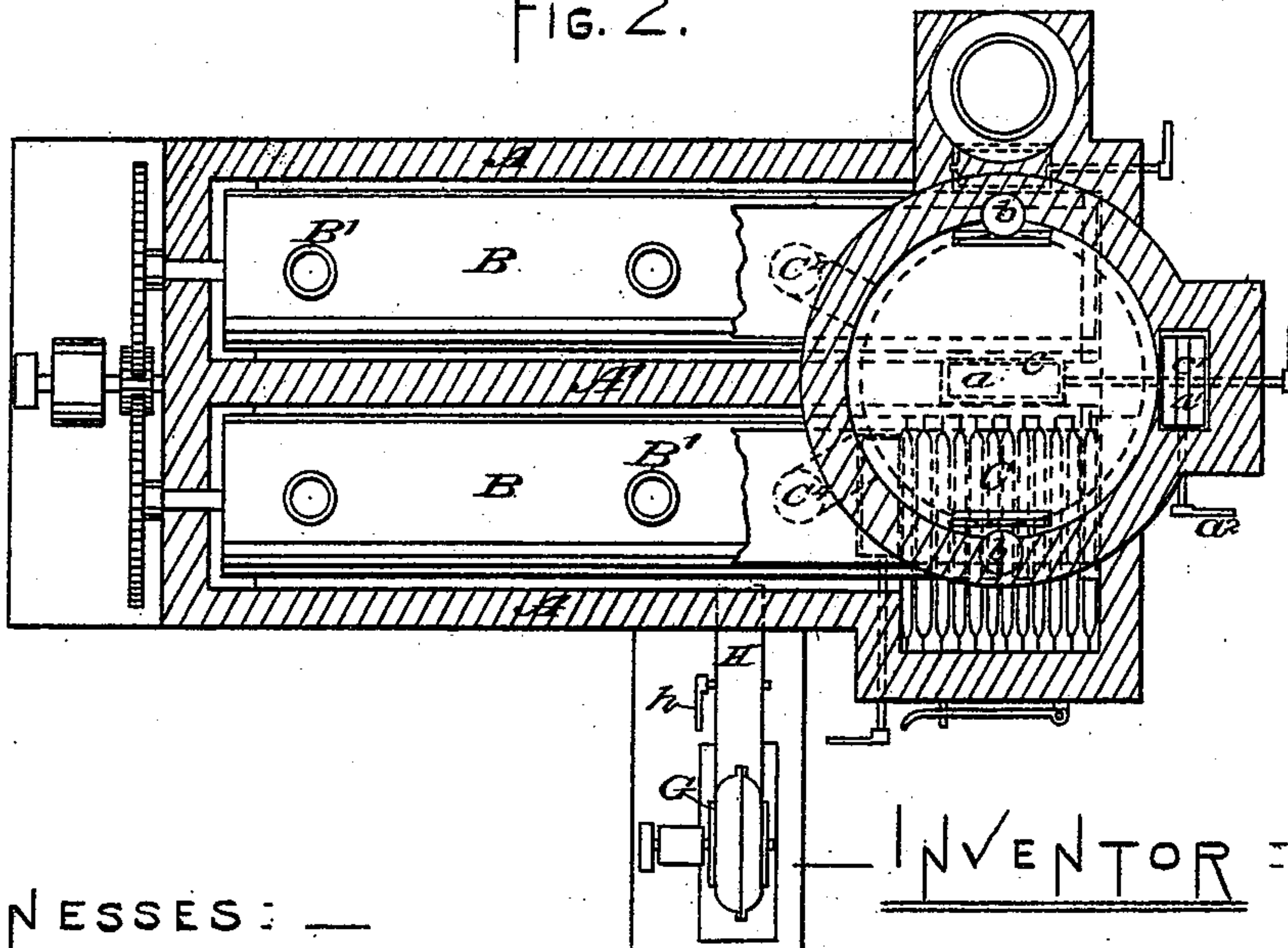


FIG. 2.



WITNESSES:

Charles C. Stetson
E. B. Bolton

INVENTOR:

Alfred Edwards
by his attorney
C. C. Stetson

UNITED STATES PATENT OFFICE.

ALFRED EDWARDS, OF NEW HAVEN, ASSIGNOR TO GEORGE R. HOPPEN,
OF BIRMINGHAM, CONNECTICUT.

APPARATUS FOR PREPARING FERTILIZERS.

SPECIFICATION forming part of Letters Patent No. 229,876, dated July 13, 1880.

Application filed July 22, 1879.

To all whom it may concern :

Be it known that I, ALFRED EDWARDS, of New Haven, in the State of Connecticut, have invented a certain new and useful Improvement relating to Apparatus for Preparing Fertilizers; and I do hereby declare the following to be a full and exact description thereof.

I have devised means, in combination with suitable apparatus for grinding and drying bones, blood, and animal offal, fish, and the like material, whereby the stock is heated before its introduction into the grinding and drying apparatus, with provisions for regulating the temperature with unusual efficiency. I can convey the heat to the supply-hopper after it has expended itself on the drying apparatus proper, or I can convey the whole or part of the gaseous products of combustion directly to the hopper without expending any of its heat on the mill. As it is possible that the material may be scorched by a too intense heat applied to either of these parts of the apparatus, I provide for conducting the products of combustion directly to the chimney at will; also for introducing cold air in certain cases.

I have devised an improved construction of the rotating parts which constitute the mill. Some of the parts, being much shorter than others, engage the coarser pieces, as the large bones, and break them small, while other arms, carrying equally efficient grinding devices, engage the finer pieces, and the whole is broken to the proper fineness.

The following is a description of the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a side elevation with certain portions of the casing broken away. Fig. 2 is a horizontal section, and Fig. 3 is a vertical end section on the line xx in Fig. 1. These figures represent the novel parts, with so much of the ordinary parts as is necessary to represent their relation thereto. Fig. 4 is a rear view of a portion of the apparatus, showing the gears which revolve the grinding-shafts. Fig. 5 is a side view of the revolving portion of a mill or grinder. Fig. 6 is an enlarged end view of the revolving portion, showing its re-

lation to the inclosing-case or cylindrical vessel, with which it serves to perform the double functions of a drying apparatus and a grinding-mill. This figure shows the construction at the end nearest the fire. Fig. 7 is an end view of the revolving part, showing the construction of the end farthest from the fire.

Similar letters of reference indicate corresponding parts in all the figures.

A is an external casing of masonry, which envelops nearly the whole apparatus. B B are cylindrical vessels, of wrought-iron or other suitable material, with a smooth interior. I will, for brevity, call these parts and their connections "drying-mills." They are mounted horizontally in the masonry, with a piece of angle-iron to fill the small space between them, and provided with ventilating-flues B', adapted to convey away the moisture and any offensive gases which may be generated.

C is a furnace with grate and doors, as usual. D is an upright case mounted over the hottest ends of the drying-mills and communicating therewith through ample passages b .

A stout upright shaft, J, carries arms j , which revolve in D and constitute the whole a pug-mill. The bottom of the case D is cone-shaped, as shown, and the arms j are correspondingly inclined and placed so as to scrape the bottom.

In each of the cylinders there is a revolving shaft, I, carrying arms. I will, for brevity, refer to the entire revolving parts in B by the symbol I^x . The furnace C is under the front end of one of the cylinders.

The hot products of combustion are best utilized by being divided, half flowing directly rearward under the same cylinder under which the fire is made, and half flowing across through a passage, c , controlled by a damper, a , which allows it to flow rearward under the cylinder of the other drying-mill. Both drying-mills receive about equal heat from the gaseous products of combustion in this movement of the latter rearward through the flues c' , and both derive the same further advantage from the hot gases in their return motion. The gases rise through the narrow spaces c^2 at the rear end of each mill, and flow forward in the flue c^3 over the top of each, thus bathing the

top as well as the bottom of each mill in the hot gases from the fire. The gases, having thus moved rearward and again forward, are discharged upward through apertures C^4 , leading into the chamber C^5 , below the body of the hopper D. This chamber C^5 communicates freely with an annular chamber, C^6 , which encompasses the body of the hopper D. The hot products of combustion from the furnace C, having circulated through the entire series of chambers C, C^1 , C^2 , C^3 , C^4 , C^5 , and C^6 , escape through a passage, C^7 , into the adjacent stack or chimney C^8 . This is the course of the gases which is necessary to utilize their heat most efficiently. It is the mode of working which I endeavor to attain; but whenever, through any cause, it becomes desirable to conduct the heat directly from the furnace C to the chamber C^5 , I can do so by means of the flue c' at the front of the apparatus. This flue is controlled by a damper, a' , governed by a lever, a^2 , accessible from the outside and conveniently placed to be operated by the attendant.

Whenever it is desired to conduct the hot products of combustion directly to the stack, this may be done through the aid of an aperture, c , in the dividing-wall A' , controlled by a damper, a , turned by a handle which is conveniently operated on the outside.

E is a horizontal heat-shield, of cast-iron or other suitable material, interposed under each drying and grinding cylinder B. It prevents the heat of the fire from being too intensely felt by the contents of the drying-cylinders.

It is important to control the descent of the stock from the hopper D into each mill through the respective passages b . I effect this by means of sliding valves b' , operated by rods b^2 , which extend out from the top of the casing, and may be operated either directly by grasping the handles or by any other required levers or apparatus.

In treating some kinds of material, such as fish and the entrails of animals, there is little occasion for breaking any large masses in the mills. But in treating other material, and especially the bones of large animals, the breaking of large masses becomes necessary and requires a special provision. I attain this by making some of the arms of the drying-mills shorter than others, so that while the long arms and the spiral bars connected thereto may scrape close to the interiors of the mills, the short arms and the spiral bars which connect them may work at such a distance from the interior of the mill-case as shall be adapted to allow large bones to engage and be crushed. I propose to make the short arms and their connecting spiral bars stouter than the long ones if it shall be found to be necessary. A simple plan is to make all the bars or spirals stout enough to break the largest bones.

In the figures, I is the shaft, I' I' the shortest arms, and i' the spiral bars which connect their extremities. I^2 are longer arms, and i^2 are spiral bars connecting their extremities. I^3 are longer arms, and I^4 are the longest arms,

the extremities of each series being connected by their corresponding bars i^3 i^4 . I arrange these in the order shown relatively to the motion of the mill, so as they follow each other the shortest arms come first and break the largest bones, the next longer arms come next, and, presenting a smaller space between their cross-bars i^2 and the interior of the mill-case, break a smaller size, and so on to the last, which runs quite close to the interior of the casing and effects the final crushing.

It will be understood that the conical form of the bottom of the pug-mill D has the double advantage of serving to increase the heating-surface and also serving to facilitate the driving out of the heated contents through the passages b , which connect at the periphery.

Both the pug-mill and the drying mill or mills may be turned by a steam-engine or other suitable power. (Not shown.) Where, as shown, two cylinders, B B, are employed, the shafts I of the revolving parts in both may be driven from a single shaft by gearing a single wheel on that shaft with the gear-wheels I^x , as indicated in Fig. 4.

In addition to the three modes shown of working the dampers to conduct the heated products of combustion more or less efficiently through the apparatus, I admit cold air when required to reduce the heat. H is an aperture for this purpose. It is controlled by a damper, h , and the air may be admitted through it in such quantities as to very rapidly lower the temperature whenever it shall be found to burn the stock.

Whenever desired, I can further reduce the heat by introducing cold air by means of a blower, G.

F is a flue leading upward from a part of the top of the chamber C^6 farthest from the chimney. It may remain always open, so as to discharge a small quantity of the products of combustion, or it may be opened at will. The effect is to induce a more equal distribution of the products of combustion over the entire circumference of the hopper D.

I can use certain parts of the apparatus without the others, though I prefer the whole in combination, as shown.

Some of the advantages of the invention may be attained by the employment of a grinding mill or mills with their appurtenances without the pug-mill.

Modifications may be made in many of the details without defeating the objects of the invention. Instead of gearing together the two mills, they may be driven by a separate train of connections.

I claim as my invention—

1. The feed-vessel D and agitating device J j , adapted to work therein, and constituting together a pug-mill, in combination with the grinding-mills consisting of the cylinders B and rotating grinding devices I^x , substantially as and for the purposes specified.

2. The combination of the pug-mill D J and the grinding and drying mills with the casing

provided with the annular chamber C⁶, the connecting-passages C¹ C² C³ C⁴ C⁵, and escape-passages C⁷ C⁸, as specified.

3. The combination of the feed-vessel D and
5 the grinding and drying mills with the dividing-wall A', having the direct flue *c* and valve *a*, and with the casing having the flues C¹ C² C³ C⁴ C⁵, annular chamber C⁶, and escape-passages C⁷ C⁸, as specified, for the purposes set
10 forth.

4. The combination of the revolving shaft I, having arms I¹ I² I³ I⁴, of different lengths,

and spiral bars *i*¹ *i*² *i*³ *i*⁴, connecting their extremities with the cylinder B, and furnace C, having flues C¹ C² C³ connected therewith, sub- 15
stantially as herein specified, for the purposes set forth.

In testimony whereof I have hereunto set my hand this 12th day of July, 1879, in the presence of two subscribing witnesses.

ALFRED EDWARDS.

Witnesses:

JAMES P. GALLIVAN,

CLIFFORD C. CHALKER.