

(No Model.)

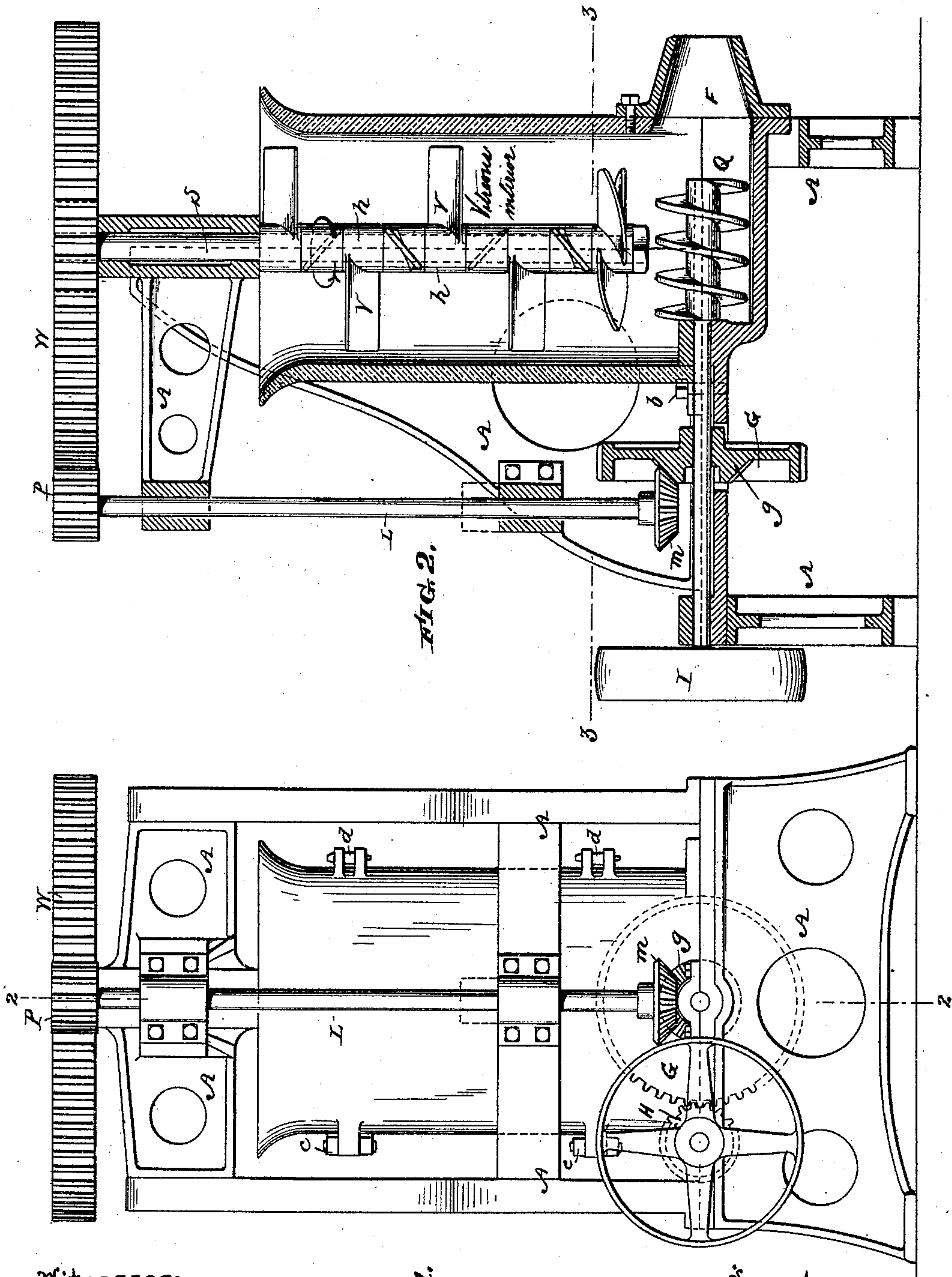
2 Sheets—Sheet 1.

J. CROSSLEY.

PUG MILL.

No. 473,497.

Patented Apr. 26, 1892.



Witnesses:

Henry Dwyer

W. E. Elmer

Fig. 1.

By his Atty.

F. L. Lawrence

Inventor:

JOSEPH CROSSLEY.

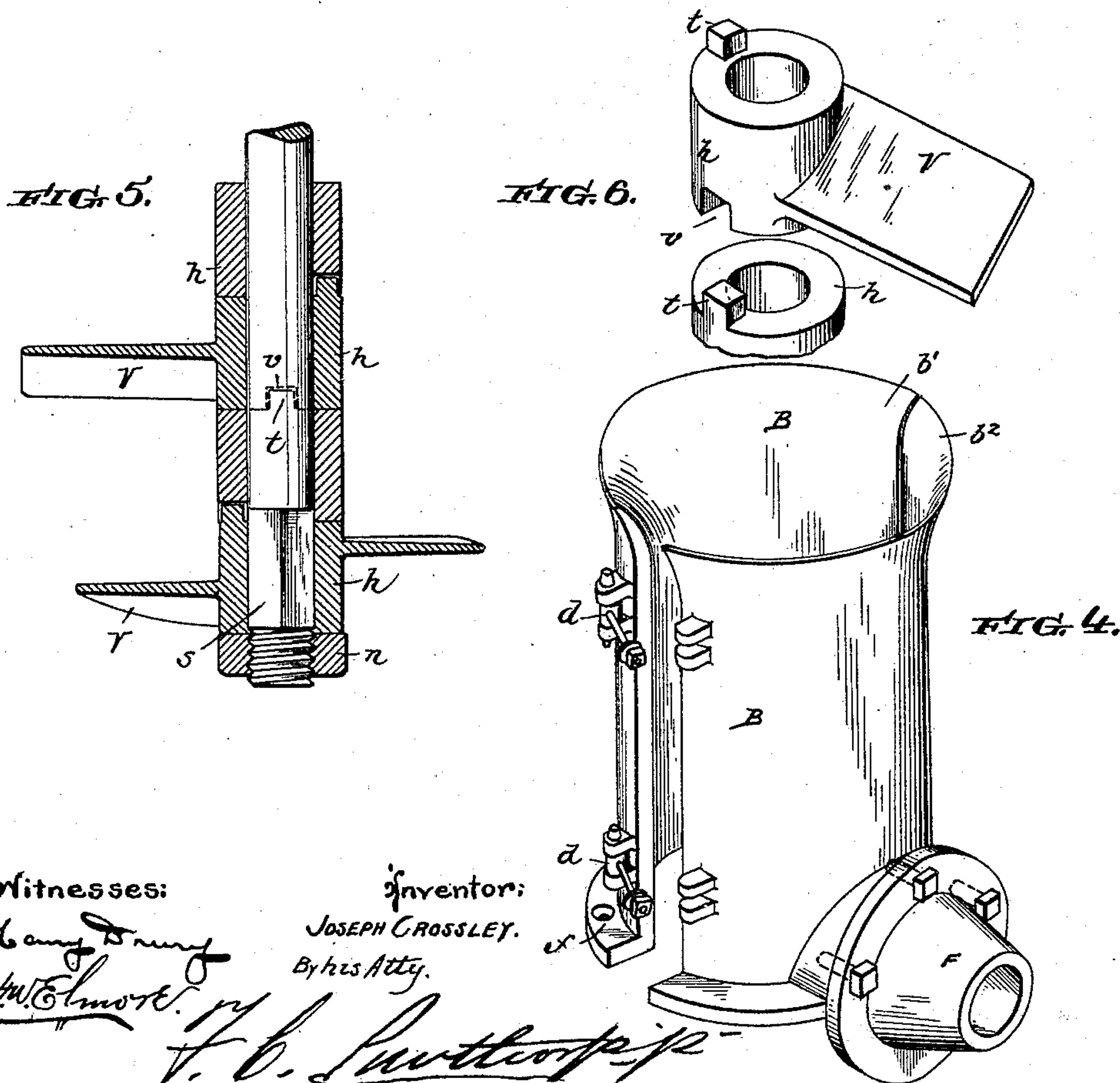
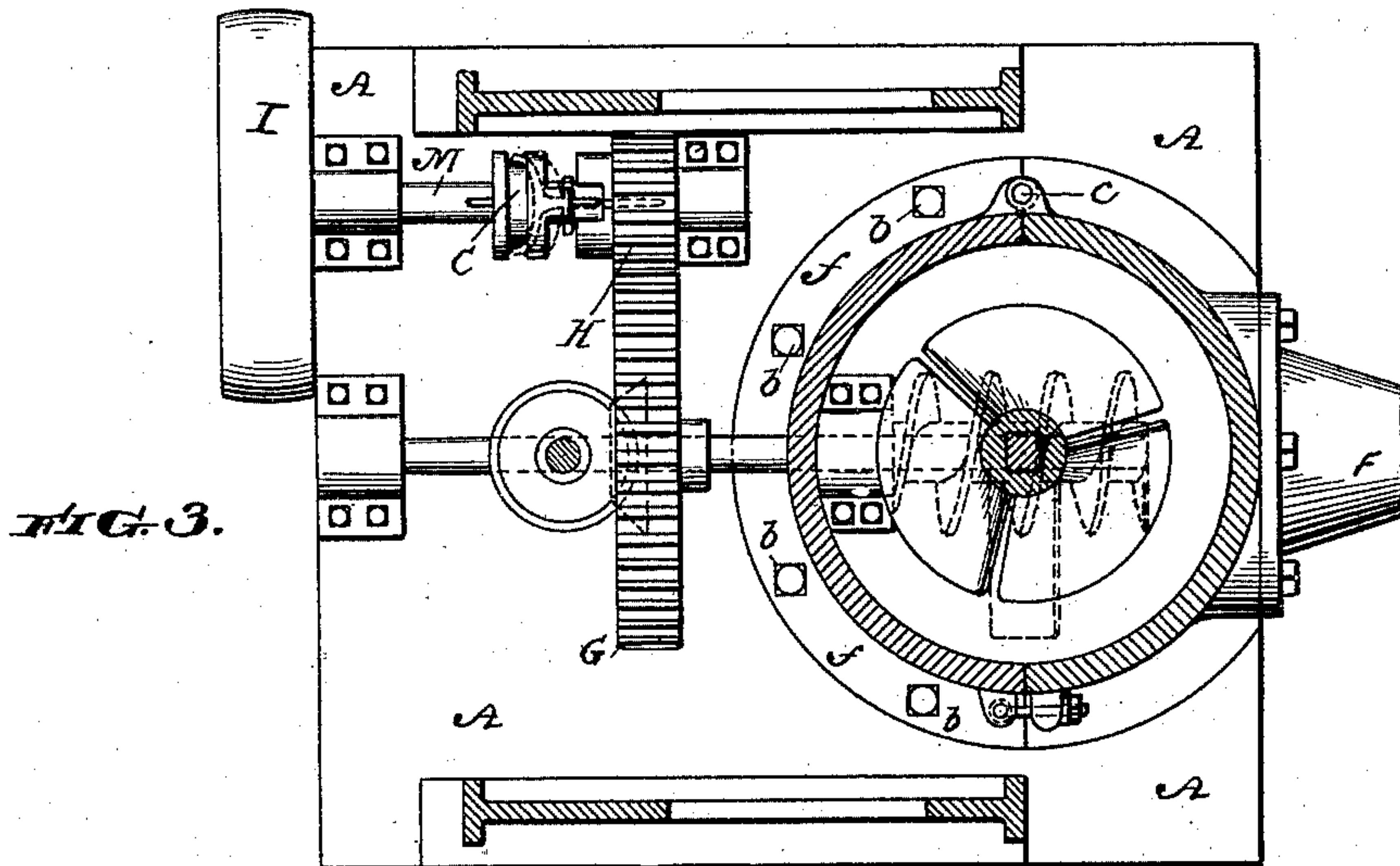
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2 Sheets—Sheet 2.

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Witnesses:

Harry Denny  
Wm. Elmore.

Inventor:

JOSEPH CROSSLEY.  
By his Atty.

H. C. Purthorpe



# UNITED STATES PATENT OFFICE.

JOSEPH CROSSLEY, OF TRENTON, NEW JERSEY.

## PUG-MILL.

SPECIFICATION forming part of Letters Patent No. 473,497, dated April 26, 1892.

Application filed August 14, 1890. Serial No. 361,961. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH CROSSLEY, a citizen of the United States, residing at Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Pug-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to that class of machines used in the working and tempering of clay in the process of manufacturing bricks, tiles, or pottery articles, known as "pug-mills."

It has for its object to provide a mill which is adapted for use with all the different kinds and varieties of clay without liability of staining or discoloring the material consequent upon the use of the iron mills now commonly employed, and, further, to provide a new and improved manner of securing the arms or flukes to the central shaft, which, among other advantages, will permit of their ready removal, and, finally, to provide a construction of cylinder which may be easily set up and readily opened for giving access to the interior.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of my complete pug-mill. Fig. 2 is a vertical section on the line 2 2, Fig. 1. Fig. 3 is a horizontal section on the line 3 3, Fig. 2. Fig. 4 is a perspective of the cylinder detached. Fig. 5 is a detail section vertically through the shaft. Fig. 6 is detail in perspective showing the manner of locking the flukes to one another.

A denotes the supporting-frame for the machine, which may be of any convenient or preferred construction, having suitable uprights, cross-pieces, base, and legs, all as represented in the drawings.

B indicates the cylinder, open at bottom and top, and one-half of which is firmly bolted to the base-piece of the frame, which forms the bottom of the cylinder, preferably by bolts *b* passing through the flange *f* at its lower edge. This cylinder is vertically divided into two parts *b'* *b*<sup>2</sup>, hinged together at one side, as at *c*, and provided on the opposite side with any suitable fastening devices *d*, those

shown in the drawings being efficient and inexpensive. Both parts of this cylinder are flanged at the bottom; but the bolts *b* need pass through the flange of one part only, this being to allow the other part to swing laterally, so as to expose the interior.

F is the discharge spout or funnel, of any suitable shape or construction, and detachably fastened to one of the halves of the cylinder. Instead of making this cylinder of cast-iron or other metal which will rust under the action of the moisture in the clay, I purpose to make it of porcelain, marbleized iron, or other suitable non-oxidizable material, thereby avoiding the staining or discoloring of the clay arising from the oxidation or rusting of the said metal cylinders. Great economy in the cost of the "plant" is obtained in thus making the cylinder out of a material which will permit of the use of different kinds of clay in the same machine, instead of having to provide different mills for the several varieties.

In the upper cross-piece of the frame A is mounted the depending shaft S, arranged centrally within the cylinder. A large spur-wheel W is fixed upon the upper end of this shaft and arranged to be driven by a pinion P on the upper end of a line-shaft L, this latter shaft being in turn driven through suitable miter-gearing *m g* by the spur-gear G, meshing with the pinion H on the main drive-shaft M of the machine. This main drive-shaft is constantly driven by a band thrown over the band-wheel I on its outer end. The pinion H is loose on the shaft, but is adapted to be connected therewith and disconnected therefrom at the will of the attendant by a clutch C, splined on the shaft and adapted to be engaged with and disengaged from the pinion by means and in a manner too common to need description. The depending shaft S is made cylindrical throughout its length except for a short distance at the bottom, where it is angular in cross-section, as shown at *s* in Fig. 5. Below this angular position its extreme end is provided with a screw-thread to secure a nut *n* to hold the hub of the end fluke in position. These flukes or vanes V are intended to be made, like the cylinder, of some substance which will not rust under the action of the moisture in the



clay. Otherwise they differ from those now in use only in the manner in which they are secured to the shaft and to each other.

In this class of machines it is desirable that there should be no knobs or projections—such as bolt-heads, nuts, or screws—on the exterior of the shaft or the interior of the cylinder. Such obstructions form air bubbles in the clay and retard and hinder the free action of the machine, besides rendering the parts very difficult to clean. To obviate these objections, instead of securing the hubs *h* of the vanes or arms to the shaft by set-screws or other devices projecting from the shaft, I fasten the end hub or sleeve alone on and to the shaft, as hereinafter described, and connect the others to the shaft by locking them one to another. The body of the shaft, as before described, is round. The sleeves or hubs *h* of the vanes are also made round to fit snugly on the shaft, except the end sleeve, whose hub is made angular on its interior to conform to the angular cross-section of the end of the shaft. This end hub, after being slipped on, is firmly secured in place by screwing the nut *n* upon the threaded end of the shaft. Upon the upper end of the sleeve I form a stud or dowel *t*, and the adjoining sleeve is provided with a notch *v* to interlock with the stud and securely fasten the two together. All the hubs except the end ones are provided on one end with the stud and on the other with the notch and fit together, as clearly shown in the drawings. This construction, it will be seen, entirely dispenses with projecting fastenings, the hubs being left smooth on their surfaces and circular in outline. It will also be seen that all the vanes can readily be removed for cleaning or repairs by simply taking the end sleeve off. In putting the parts together the round shaft has the advantage over the angular one of allowing the hubs to be slipped on at random, the end one only requiring any adjustment. It is preferred to make the studs and notches at different points on the circle of the hubs, so that when in position they shall break joints, as it were, as seen in Fig. 5.

In the bottom of the cylinder is arranged

the feeding or ejector worm *Q*, it being mounted on one end of the shaft carrying the wheel *G*, the shaft turning in suitable boxes or bearings on the base-plate of the framing. The worm is set in line with the discharge-spout *F*, diametrically across the cylinder, and is properly geared and timed with the revolutions of the agitating-arms.

The operation of the invention is very simple and easily understood by those skilled in the art. It needs no particular description.

Though I have described the cylinder and flukes as made of porcelain or other non-oxidizable material, it is obvious that they may be made of cast-iron or other metal liable to rust and be coated with a vitreous or other coating which will not be affected by the moisture in the clay. It is also intended that the ejector-worm and the base-piece forming the bottom of the cylinder should be made of the same material. In fact, all parts of the mill which are exposed to contact with the clay are to be so formed or treated.

While I have shown the shaft *S* as round, it may be angular throughout its length, though the round form is preferred as more convenient.

Having thus described my invention, what I claim is—

In a pug-mill, the combination of the two-part cylinder, the detachable spout on the lower end of the removable part of the cylinder, the agitator-shaft supported at its upper end and depending within the cylinder, the ejector-worm shaft in the bottom of the cylinder beneath the agitator-shaft and in line with the discharge-spout, the drive-shaft *M*, the loose pinion *H* and sliding clutch *C* thereon, the gear *G* on the ejector-shaft meshing with the pinion *H*, and the line-shaft *L*, driven by the gear *G* and driving the gear *W* on the upper end of the agitator-shaft, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOS. CROSSLEY.

Witnesses:

HENRY T. COOK,  
JOS. L. WATSON.