(No Model.)

2 Sheets—Sheet 1.

J. WALKER.

CRUSHING MILL.

No. 544,872. Patented Aug. 20, 1895.

Fig. 1

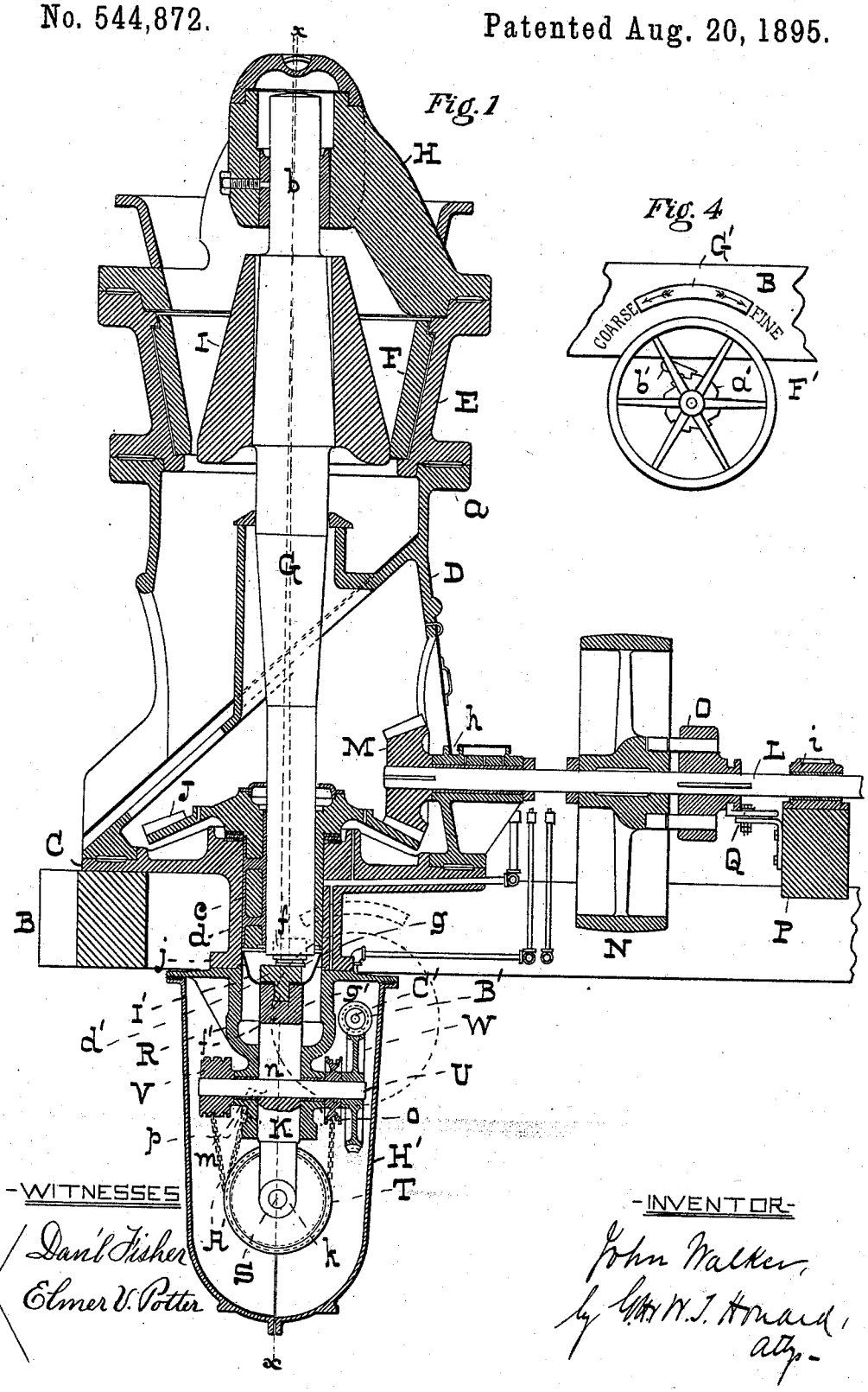

Fig. 4

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2

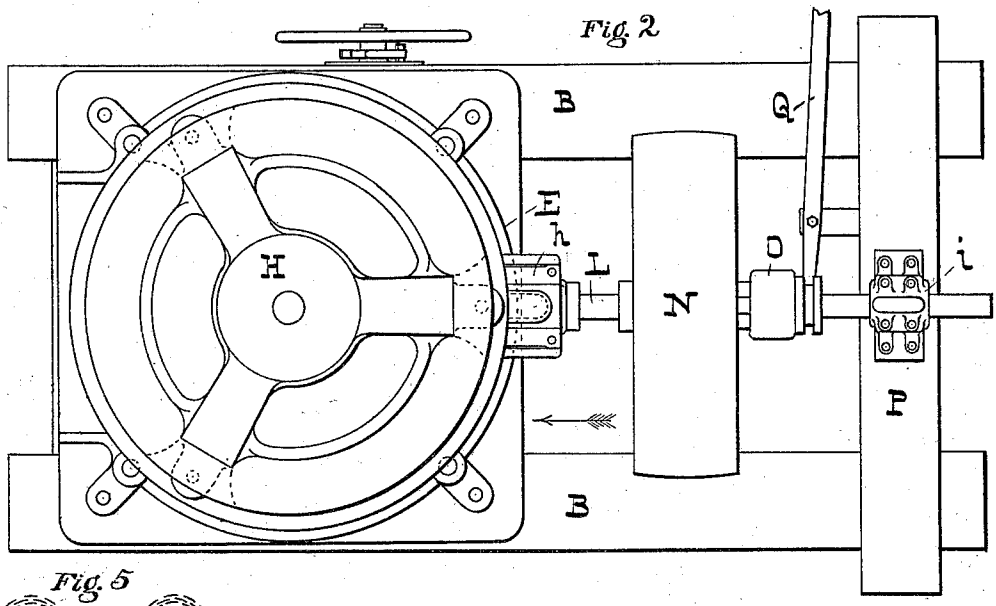


Fig. 5

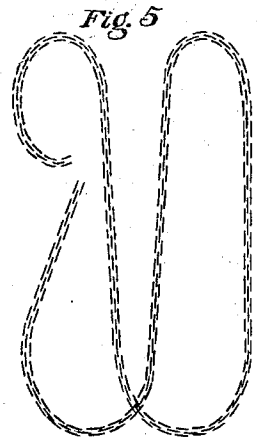
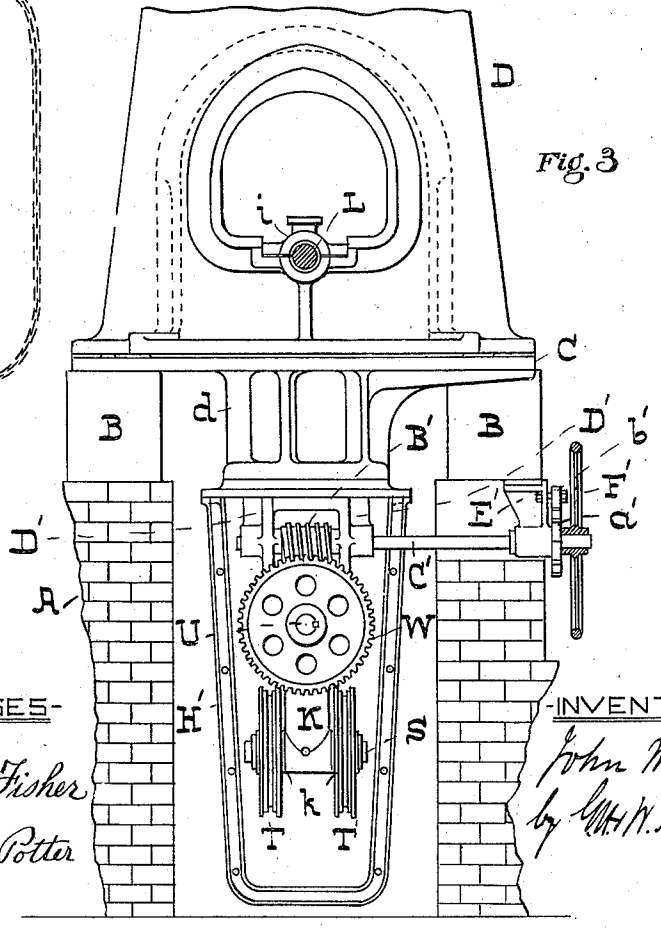


Fig. 3



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UNITED STATES PATENT OFFICE.

JOHN WALKER, OF CHICAGO, ILLINOIS.

CRUSHING-MILL.

SPECIFICATION forming part of Letters Patent No. 544,872, dated August 20, 1895.

Application filed March 23, 1895. Serial No. 542,891. (No model.)

To all whom it may concern:

Be it known that I, JOHN WALKER, of the city of Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Crushing-Mills, of which the following is a specification.

In the description of the said invention which follows reference is made to the accompanying drawings, forming a part hereof, and in which—

Figure 1 is a vertical central section of the improved mill, and Fig. 2 a plan of the same. Fig. 3 is a partly-sectional view of certain parts of the mill, looking in the direction indicated by the arrow in Fig. 2. Figs. 4 and 5 are details of the invention, as hereinafter fully described.

Referring now to the drawings, A represents the foundation, B the sills, C the bed-plate, and D the frame, of the mill. The frame D is a hollow frustum of a cone having a flange *a* at its upper end, to which is secured the conical hopper E, containing the removable crusher-liner F.

G is a gyratory spindle having its upper bearing in the tripodal bridge H, which is fastened to the hopper E.

The vertical center line of the mill is denoted by the dotted line *x x*, and the axis of the inclined spindle is coincident with or crosses it at the point *b*, as shown in Fig. 1.

I is the crusher-head, fastened to the spindle G.

J is a beveled gear-wheel having a long hub *c* on its under side adapted to turn in a bearing *d*, formed in the bed-plate C. The axis of the beveled gear-wheel J is coincident with the vertical center line of the mill, but the beveled wheel is bored in alignment with the inclined axis of the spindle G. Consequently in the rotation of the beveled wheel the spindle is given a gyratory movement without rotation about the axial line *x x* of the mill. The beveled gear-wheel J being loose on the inclined spindle G, the spindle and its crushing-head may be raised and lowered independently of the said gear-wheels. It is not new to have the inclined spindle non-revoluble and loose in the revoluble gear-wheel, so that in the rotation of the wheel the spindle and its crusher-head will have a gyratory motion without revolution, as described, and I therefore make no claim to such construction and arrangement. The spindle G at its lower end has a hardened hollow-faced die *f*, which rests on a toe *g*, seated on the upper end of a non-revoluble supporting-shaft K, which is hardened. This non-revoluble supporting-shaft, before my present invention, has generally been stepped on a screw, whereby a limited vertical adjustment of the spindle and crusher-head could be obtained.

L is a counter driving-shaft carrying a beveled pinion M in gear with the beveled wheel J. This driving-shaft is provided with a loose driving-pulley N and a clutch O on a feather, whereby motion of the pulley is communicated to the shaft. One bearing *h* of the counter-shaft L is in the frame B, and the other *i* on a cross-sill P, and an ordinary lever Q is employed to move the clutch so as to set the mill in motion or stop its operation.

The mill is provided with various oiling devices and appliances looking to the taking up of wear; but these, as well as the other parts of the mill above described, form no part of the present invention, and they therefore require no further description herein.

The non-revoluble shaft K, before mentioned, is extended in the present invention downward through a suitable sleeve R, bolted to the flange *j* of the portion of the bed-plate which forms the bearing for the hub of the gear-wheel J, and at its lower end is provided with lateral extensions or bosses *k*, which constitute bearings for a shaft S, which is stationary. On the ends of the shaft S are two grooved wheels or sheaves T, which are loose on the shaft, as they revolve, when moved at all, in opposite directions, as hereinafter described.

U is another and revoluble shaft adapted to turn in bearings *m*, formed in bosses projecting from the sleeve R. This shaft, which passes through a slot *n* in the non-revoluble shaft K, carries at one end a spirally-grooved drum V and at the other a grooved sheave *o* and a worm-wheel W.

A′ is a chain attached at one end to the spirally-grooved drum V and at the other to a boss *p* on the sleeve R. The loop of the chain passes under the wheels T and over the loose sheave *o*, as shown. Fig. 5 shows the chain alone in perspective.

B′ is a worm on the shaft C′, which is supported in bearings in pendent brackets D′, extending from the upper flange of the sleeve R. The outer end of the shaft C′ passes through a third bearing in a hanger E′, bolted to the under side of one of the sills B and is provided with a hand-wheel F′, and between the hand-wheel and the hanger are a ratchet-wheel *a′* and a pawl *b′*. Supposing the head I to be situated somewhat lower than it is represented in the drawings and it is desired to raise the crusher-head to make the product of the mill of a finer grade, the hand-wheel F′ is turned in the direction of or toward the word "fine," which winds the chain around the drum. The ratchet-wheel and pawl hold the shaft C′ in any position in which it may be placed. In this operation the chain A′ is wound around the drum V, thus raising the spindle G with its crusher-head. It will be understood that as the sheave *o* is loose the strain throughout the chain and on the pulleys T is equalized. To lower the crusher-head, the operation as described is reversed by turning the hand-wheel in a contrary direction or toward the word "coarse."

By reference to Fig. 4 it will be seen that one of the sills B has a segmental indicating-plate G′, which is suitably marked with the words "coarse" and "fine," to guide the attendant in turning the hand-wheel to grade the product of the mill. All the mechanism below the sills B is inclosed within a hood H′ to prevent entrance of dust to the moving parts.

I′ is an oil-pan situated in the sleeve R and around the non-revoluble shaft K to retain oil in contact with the toe and its connections to lubricate them. By having the upper edge of the oil-pan I′ above the lower end of the revoluble spindle G, when the same is in its highest position the frictional surfaces of the toe and the non-revoluble shaft are always immersed in oil. To admit of the attachment of the oil-pan to the non-revoluble shaft K, the hardened end *d′* of the shaft is made separate and provided with a pin *f′*, which enters a hole *g′* in the shaft, as shown in Fig. 1, in which the oil-pan, the hardened end *d′*, and its pin *f′* appear in section, and the non-revoluble shaft K partly in section.

From the foregoing description it will be understood that the spindle with its crusher-head is supported primarily by a chain which may be practically lengthened or shortened to lower or raise the spindle with its crusher-head, the spindle moving through the bearings in the beveled gear and the tripodal bridge. The adjustment of the crusher-head is therefore a very simple operation and one that is performed from a position exterior of the mill-foundation and while the mill is in operation.

I claim as my invention—

1. In a crushing mill, the gyratory spindle carrying the crusher head, combined with a supporting shaft for the spindle, sheave mechanism attached to the lower end of the supporting shaft, a chain to sustain the sheave mechanism, and devices to wind and unwind the said chain so as to practically shorten and lengthen it and thereby raise and lower the crusher head, substantially as specified.

2. In a crushing mill, the gyratory spindle carrying the crusher head, combined with a supporting shaft, a pair of sheaves attached to the lower end of the supporting shaft, a looped chain to sustain the sheaves, and mechanism to wind and unwind the chain and thereby raise and lower the crusher head, substantially as specified.

3. In a crushing mill, the gyratory spindle carrying the crusher head, combined with a non-revoluble shaft having a transverse slot therein, a shaft which passes loosely through the said slot having at one end a winding drum, and at the other a loose grooved sheave and a worm wheel, a shaft carrying a worm in gear with the worm wheel, a shaft at the lower end of the supporting shaft having grooved wheels, a chain attached at one end to the winding drum and at the other to some stationary part of the mill, with its intermediate portion or loop passed under the grooved wheels and over the grooved sheave, and means to revolve the said worm shaft, and thereby raise or lower the said gyratory spindle, substantially as specified.

4. In a crushing mill, the gyratory spindle carrying the crusher head, combined with a supporting shaft, a pair of sheaves attached to the lower end of the supporting shaft, a looped chain to sustain the sheaves, mechanism to wind and unwind the chain and thereby raise and lower the crusher head, and a hood which incloses the sheaves, chain and the winding mechanism, substantially as specified.

5. In a crushing mill, a supporting shaft for the gyratory spindle having a transverse slot and provided at its lower end with a pair of wheels, a suitably supported revoluble shaft extending through the transverse slot of the supporting shaft having at one end a winding drum and at the other a loose sheave, mechanism to revolve the said revoluble shaft, and a chain rove under the wheels and over the sheave and with one end attached to the said winding drum and the other to some fixed part of the mill, substantially as specified.

6. A sustaining shaft for the spindle of a crushing mill having a removable head piece, combined with an oil pan the bottom of which is confined between the sustaining shaft proper and the head piece, substantially as specified.

JOHN WALKER.

Witnesses:
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JOHN H. MCGAY.