

(No Model.)

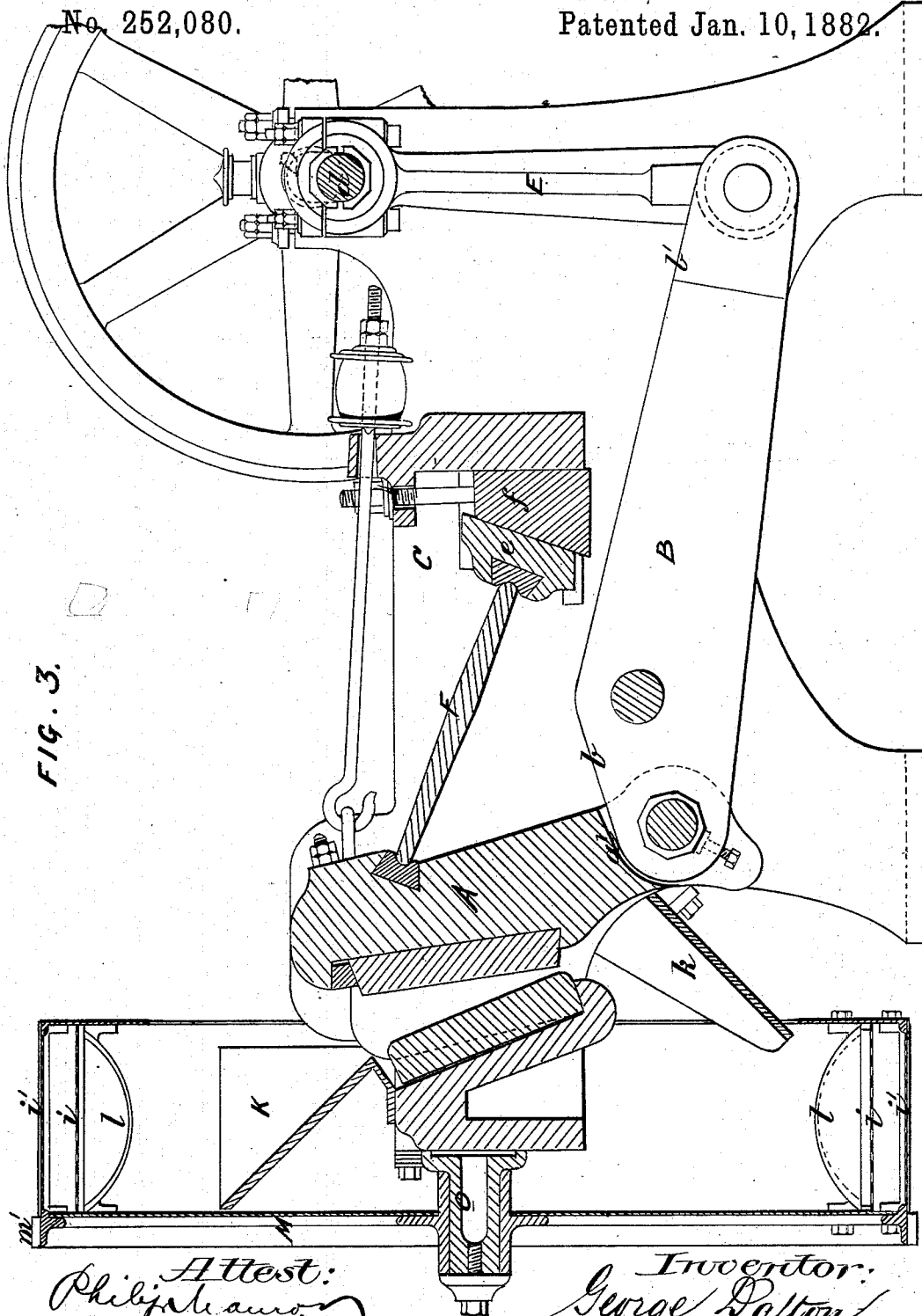
4 Sheets—Sheet 2.

G. DALTON.

MACHINERY FOR CRUSHING ORE, &c.

No. 252,080.

Patented Jan. 10, 1882.



(No Model.)

4 Sheets—Sheet 3.

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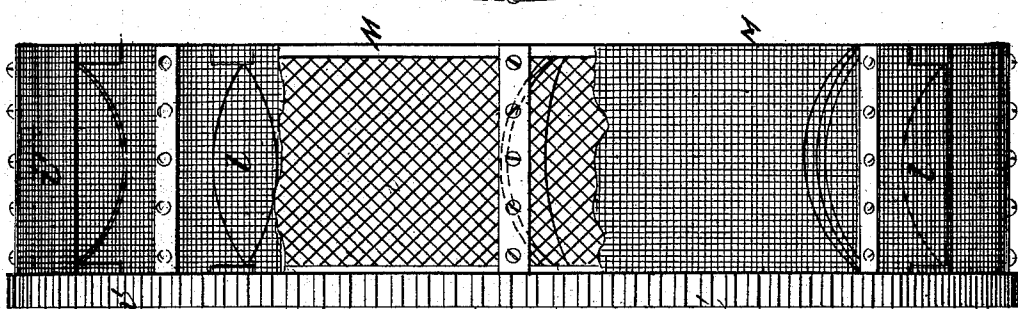
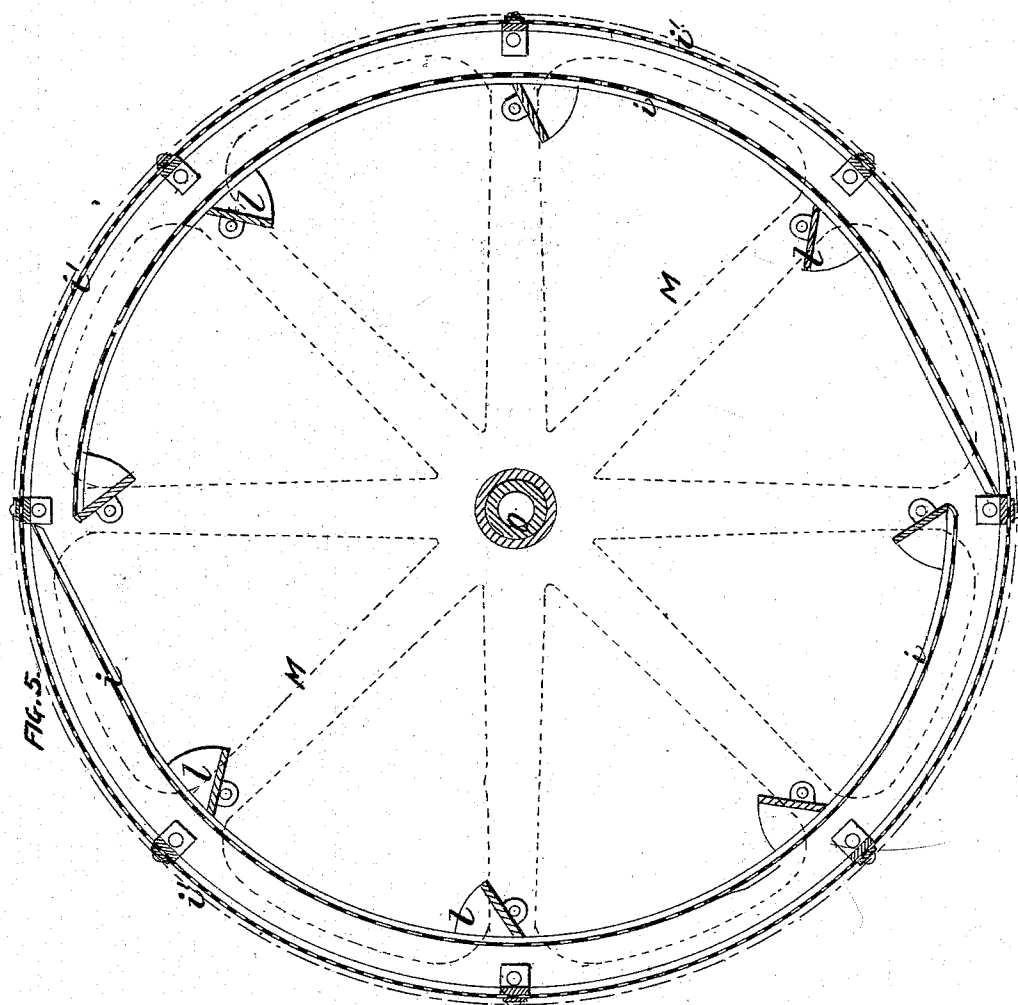


FIG. 6

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Inventor:
George Dalton
by A. Pollok
his attorney.

(No Model.)

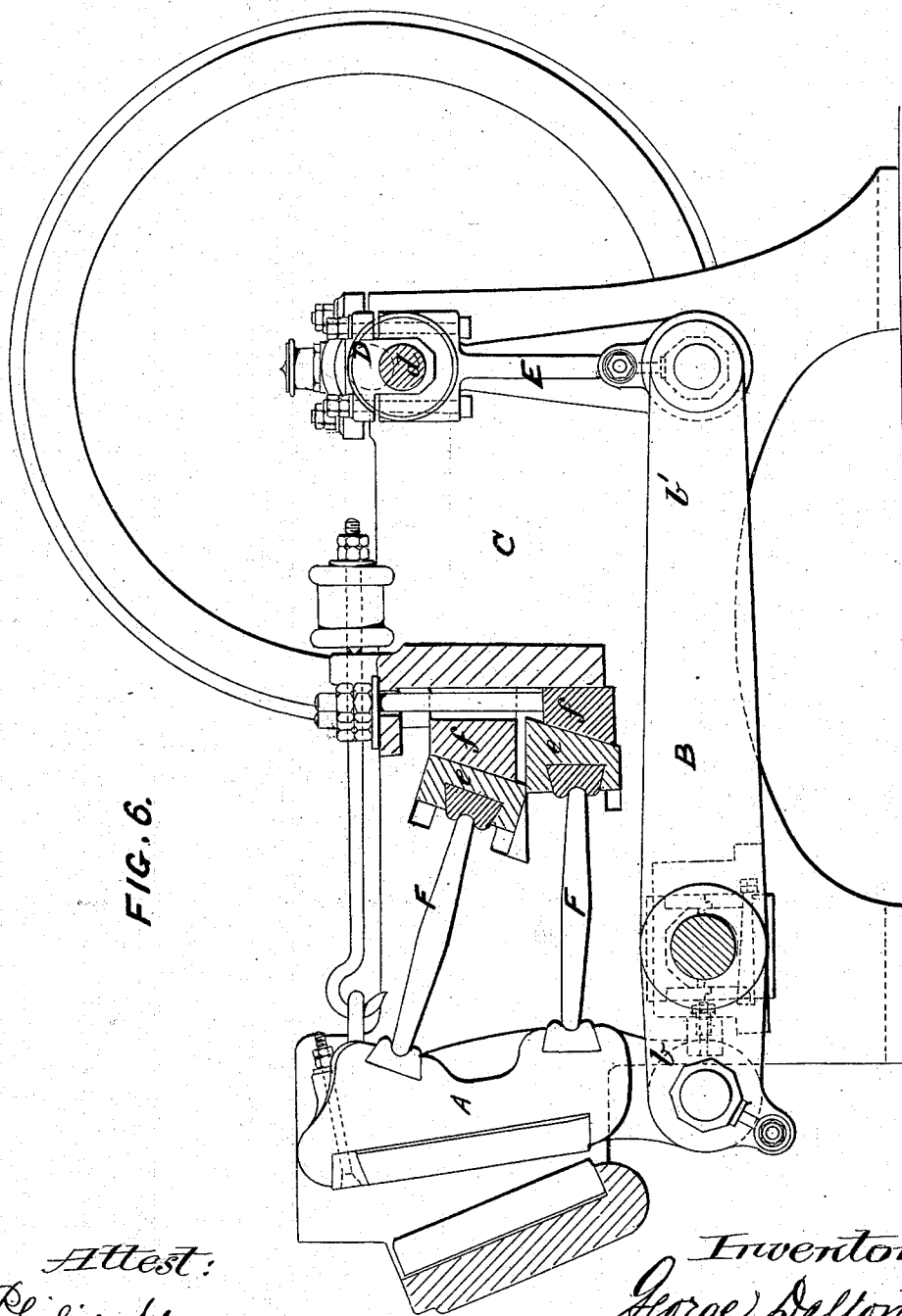
4 Sheets—Sheet 4.

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MACHINERY FOR CRUSHING ORE, &c.

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Attest:
Philip M. Lamm
C. J. Hedrick

Inventor:
George Dalton
by A. S. Lollok
his attorney

UNITED STATES PATENT OFFICE.

GEORGE DALTON, OF LEEDS, COUNTY OF YORK, ENGLAND.

MACHINERY FOR CRUSHING ORES, &c.

SPECIFICATION forming part of Letters Patent No. 252,080, dated January 10, 1882.

Application filed October 24, 1881. (No model.) Patented in England January 27, 1880.

To all whom it may concern :

Be it known that I, GEORGE DALTON, a subject of the Queen of Great Britain, and residing at Leeds, in the county of York, England, have invented certain improvements in and connected with machinery or apparatus for crushing or reducing gold-quartz, ores, coprolites, cement, clinker, or other like substances to an impalpable powder, (for which I have obtained a patent in England, No. 365, dated 27th January, 1880,) of which the following is a specification.

My invention relates to machinery or apparatus for crushing gold-quartz, ores, coprolites, cement, clinker, or other like substances which require to be reduced to an impalpable powder; and it has for its object rendering the said machine better adapted for being employed in the crushing or reducing of coprolites, cement, clinker, or other like substances.

In carrying out my invention in order to effect this object the oscillating or movable jaw is pivoted to one arm of a double-armed lever or levers mounted upon a center or fulcrum in the framing, and the other arm of such lever or of each of such levers is jointed to a connecting-rod operated by an eccentric cam or crank upon the actuating-shaft. An adjustable toggle or toggles is or are provided for obtaining the lateral thrust of the jaw, which, in conjunction with its downward motion, produces the crushing action. By means of the arrangement and combination of the parts hereinbefore described the great crushing strain is sustained by the toggle or toggles and by the main frame of the machine, and not by the actuating-shaft.

I combine with the crushing apparatus a sieving apparatus and elevator, so that the portions of the material not sufficiently reduced may be separated from the fine portions and carried up, to be again passed through the crushing apparatus.

The details of arrangement of the parts of the apparatus generally may be somewhat modified without departing from the principle of the invention or altering the character of the machine.

I have shown in the accompanying drawings three types of the crushing apparatus, which only differ from each other in the relative lo-

cation of certain of the parts, and two modifications of the sieving and elevating apparatus, either of which, as desired, may be used in combination with any one of the three types of crushing apparatus.

Figure 1 represents a longitudinal vertical section of a crushing or reducing and sieving and elevating machine constructed and arranged according to my said invention. In this type the crushing or reducing apparatus is adapted for operating upon material of a very hard nature, and the sieving apparatus is arranged immediately beneath the crushing or reducing apparatus, and is combined with a chain or endless-band elevator.

Fig. 2 is a plan of the combined machine corresponding to Fig. 1.

Fig. 3 represents a longitudinal section of a combined machine of the second type, in which the crushing or reducing apparatus is more particularly adapted for operating upon softer material. In this example a raff-wheel or revolving sieving and elevating apparatus is shown in combination with the crushing or reducing apparatus; but a sieving and elevating apparatus of the description shown in Figs. 1 and 2 may be employed in substitution for the revolving apparatus in this second type of machine, and the revolving apparatus may be likewise substituted in the first type of machine for the sieving and elevating apparatus shown in Figs. 1 and 2.

Figs. 4 and 5 are respectively an elevation and section of the raff-wheel or revolving sieving and elevating apparatus.

Fig. 6 represents a longitudinal section of a crushing or reducing apparatus of the third type, which is specially designed for reducing very hard materials to a fine state of division. The sieving and elevating apparatus is not shown in this figure, although intended to be used. Either of the two modifications shown in the other figures may be selected.

Referring to Figs. 1 and 2, the oscillating or movable jaw A is pivoted at its upper end, *a*, to one arm, *b*, of a double-armed lever, B, mounted upon a center or fulcrum, *c*, in the framing C, and the other arm, *b'*, of which lever is jointed at *b*² to a connecting rod, E, operated by an eccentric cam or crank, *d*, upon the actuating-shaft D. A downward motion is thus imparted to the oscillating or movable

jaw A, and the lateral thrust of the jaw (which, in conjunction with its downward motion, produces the crushing action) is communicated through the intervention of a toggle or toggles, F, the latter being in this type of machine arranged at the bottom of the jaw A, so as to take nearly the whole of the back-pressure. The toggle-block *e* is adapted to guides *e'* *e''* in the frame, and may be caused to slide outward or inward in order to vary the angle of the toggle or toggles by the act of adjusting the transverse wedge *f*, and the throw of the jaw A can be thus varied as required, according to the degree of division of which the material under operation is to be reduced.

Below the jaws of the machine is placed the sieving apparatus G, carried by a pivoted bar, *g*, and having a to-and-fro vibratory or shaking motion imparted to it through the intervention of a crank and connecting-rod, *h*, from a revolving shaft, H. The sieving apparatus is provided with screens *i* *i'*, of different mesh, the upper one, *i*, having a coarse and the lower one, *i'*, a fine mesh. The material which has been reduced to a sufficiently fine state of division passes through both screens, and may be delivered at *k* into any suitable receptacle, while the coarser portion of the material is conducted into the elevator I, and by its buckets *l* carried up and discharged into the chute K, to be again passed through the machine. The shaft H may be driven by a belt and pulleys, *m*, from the main shaft D, and may in its turn drive the elevator I through the intervention of a belt and pulleys, *n*, one of such pulleys being fast on the upper shaft, *n'*, of the elevator.

Fig. 3 illustrates the second type of machine, and Figs. 4 and 5 show in detail the raff-wheel or revolving, sieving, and elevating apparatus, which is represented as employed in combination with the crushing or reducing apparatus in this type of machine.

The crushing or reducing apparatus shown in Fig. 3 only differs from that hereinbefore described with reference to Figs. 1 and 2 in the following features, videlicet: The lever B is pivoted by its arm *b* to the lower end, *a'*, of the movable jaw A, and the toggle or toggles F are arranged above. In this case, for convenience, the wedge *f*, by means of which the position of the toggle-block *e* is adjusted, is operated in a vertical direction, the block working between lateral guides in the frame.

The sieving or elevating apparatus (shown in detail in Figs. 4 and 5) consists of the wheel M, which is mounted on a center or axis, O, carried by the frame of the machine, so as to be free to revolve thereon, and has rotary motion imparted to it by any convenient means—such, for example, as by spur-gearing—the wheel M being shown provided on its outer periphery with teeth *m'* for this purpose. The wheel is formed with screens *i* *i'*, the inner one, *i*, having a coarse mesh and the outer one, *i'*, a fine mesh. The material which has been oper-

ated upon in the crushing or reducing apparatus is discharged therefrom at *k* into the wheel M, and that portion of the material which has been sufficiently reduced passes direct through both screens of the revolving wheel, and is delivered into any suitable receptacle, while the coarser portion of the material is carried up by the buckets *l* and discharged into the chute K, to be again passed through the machine. As before mentioned, I may substitute for the raff-wheel in this type of machine a sieving and elevating apparatus of the description shown in Figs. 1 and 2; and the raff-wheel may, if desired, be employed in the first type of machine in substitution for the sieving and elevating apparatus shown in those figures.

The third type of machine is illustrated in Fig. 6. It differs from the second type only in the use of two toggles or sets of toggles, F, which take the whole of the back-pressure. The sieving and elevating apparatus is not shown in this figure; but either of the two kinds hereinbefore described may be employed in combination with the crushing or reducing apparatus.

I claim as my invention—

1. The combination, with the fixed and movable jaws and operating-shaft of a crusher or reducing apparatus, of a rigid lever fulcrumed in the machine-frame, means for connecting it with the movable jaw and shaft, as explained, for imparting an up-and-down movement from the latter to the former, toggle-blocks, and one or more toggles arranged between stationary toggle-blocks and said movable jaw, so as to cause the latter to approach the fixed jaw by the downward movement thereof, substantially as described.

2. The combination, with the movable jaw and operating-shaft of a crusher or reducing apparatus, of a lever fulcrumed between the said jaw and shaft and pivoted at one end to said jaw, connecting-rod, crank on said shaft, one or more toggles, and stationary toggle-blocks, substantially as described.

3. The combination, with a crusher or reducing apparatus comprising fixed and movable jaws, and mechanism, as explained, for imparting to the movable jaw a movement up and down, and of approach to and recession from the fixed jaw, of a sieving apparatus located with reference to said crusher or reducing apparatus as shown, and an elevator arranged to lift and deliver between the jaws of the crusher the material too large to pass through the sieving apparatus, substantially as described.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

GEORGE DALTON.

Witnesses:

A. V. DOCKERY,
CHAS. GILLIARD.