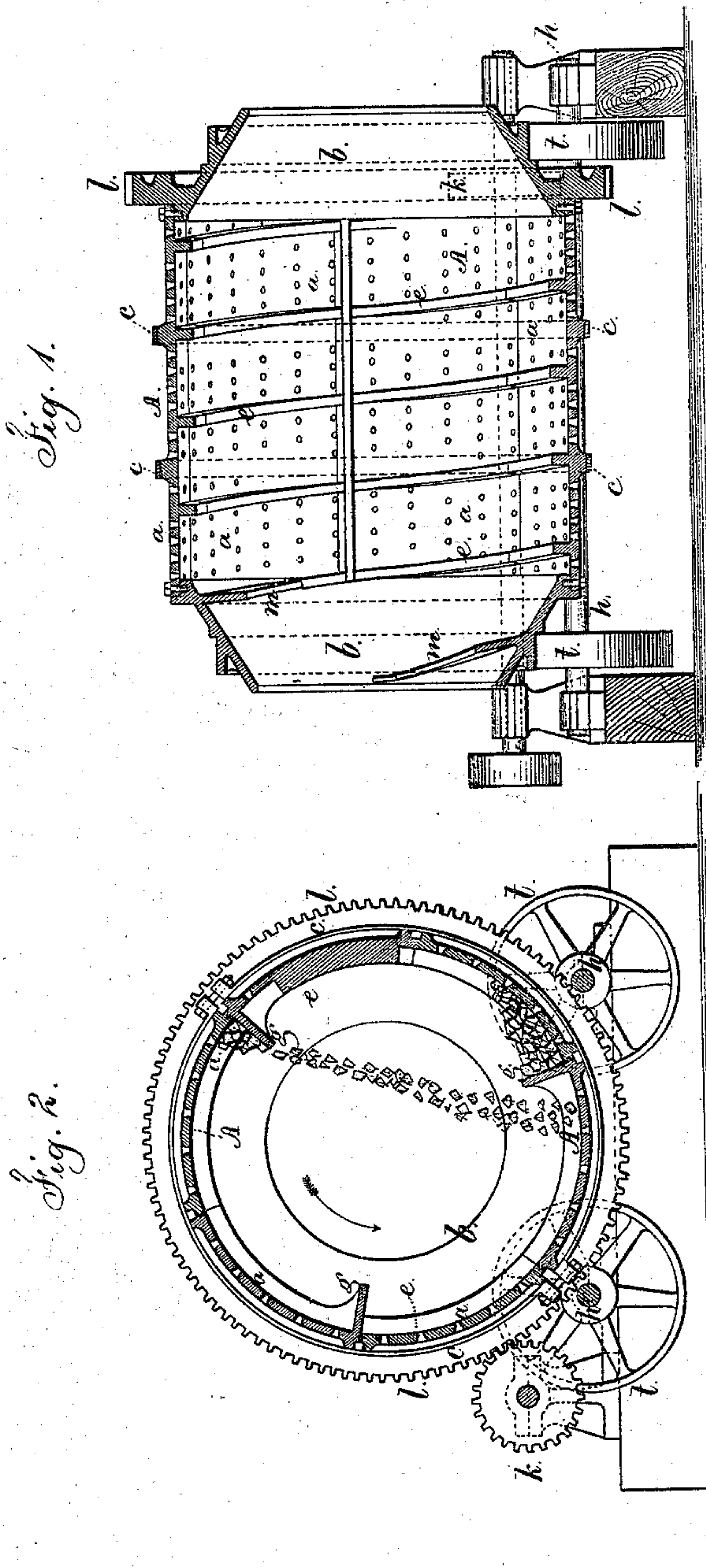


H. BRADFORD.  
Coal-Breakers.

No. 143,745.

Patented Oct. 21, 1873.



Witnesses.

Chas. H. Smith  
Geo. D. Walker.

Inventor.  
Hezekiah Bradford,  
Lemuel W. Ferrell  
att'y.



# UNITED STATES PATENT OFFICE.

HEZEKIAH BRADFORD, OF READING, PENNSYLVANIA.

## IMPROVEMENT IN COAL-BREAKERS.

Specification forming part of Letters Patent No. 143,745, dated October 21, 1873; application filed April 8, 1873.

*To all whom it may concern:*

Be it known that I, HEZEKIAH BRADFORD, of Reading, in the State of Pennsylvania, have invented an Improvement in Coal-Breakers, of which the following is a specification:

Coal has usually been broken between cylinders armed with spikes that penetrate the coal and reduce it to the required maximum size; but in so doing there is considerable fine coal and dust produced in consequence of the spikes acting so as to grind or pulverize the coal, and one lump being forced against another, and the hard slate intermixed in layers and otherwise in the lumps, frequently break the teeth of the rollers, unless it is previously separated by hand at great expense, and when that is too costly the coal is thrown away with the refuse on the waste-bank at the colliery.

The object of this invention is to break the coal by concussion, and pass the lumps and small pieces out of the machine as soon as reduced to the maximum size; thereby the grinding action is prevented, and coal that otherwise would be reduced to dust is uninjured, and can be separated from the small amount of dust that is formed and from the smaller sizes of coal, while the slate, which is too hard to break by the force or concussion that breaks the coal, will pass out at the end of the machine and be delivered separately. It may also be used for other purposes wherever applicable.

I make use of a large cylinder of cast-iron, perforated with numerous holes, of a size adapted to pass pieces of coal of the intended size. This cylinder is made very rigid, and it is revolved upon supporting-rollers by gearing, so that said cylinder does not require a shaft. The ends of the cylinder are open, and the coal is supplied from a chute with regularity, preferably in the rough lumps, as quarried; and as the cylinder is revolved the coal is lifted by shelves, and allowed to fall upon the bottom, where it is shattered by the concussion, and the pieces that are small enough sift through the perforations, and only the pieces that are too large to pass are carried up. In this manner the pieces of slate will be but little broken, but the coal will be broken off from the same. In the inside of the cylinder there is a screw-flange that causes the material to

progress from the supply end toward the delivery end, where the pieces of slate, stones, tools, logs, or other refuse matters are lifted by inclines in the cylinder and delivered. This flange also serves to make the plates more rigid, and to form a rib upon which the lumps break easily as they fall.

By this device the coal is kept much more free from slate than heretofore, and the foreign substances harder than coal that are liable to break the present machinery do not injure this mechanism, but pass through the cylinder.

In the drawing, Figure 1 is a longitudinal section, and Fig. 2 is a cross-section, of the improved breaker.

The cylinder A is made of staves *a a*, with ribs upon their outer sides to stiffen and strengthen them. They are perforated with as many holes as consistent with strength, and the holes are of a size to pass the desired maximum size of coal. These staves are united at their ends to the open conical ring-shaped heads *b b*, and wrought-iron hoops *c c* are employed to clamp the staves together at suitable distances. The interior of the cylinder A is made with a spiral or screw flange, *e*, that serves to progress the coal from the supply to the delivery ends, and there are shelves *g g* at proper distances apart, running longitudinally of the cylinder, to lift the coal and drop it upon the inside of the cylinder, to shatter it by concussion. The coal does not fall upon the coal in the lower part of the cylinder, but upon the metal thereof, because the coal is constantly carried toward and upon the rising side and shelf. The rollers *t t* upon the shafts *h h* serve to support the cylinder A as it is revolved by means of a pinion, *k*, acting upon the toothed ring *l* around said cylinder A. The lifting screw-blade *m*, applied near the delivery end of the breaker, elevates any slate or foreign matter too hard to break, and discharges the same. This screw-blade is a continuation of the screw-formed flange in the cylinder *a*, and lifts any foreign matter, so as to carry it out of the conical end of the cylinder. The cylinder is to be of a diameter adapted to the desired use, so that the coal will fall from the proper height. The shelves are to be of a width and angle proportioned to the work to be done and the speed of revolution, so that the coal



may slide off the shelves at the proper point to fall upon the required portion of the inner side of the cylinder. Blades or teeth may project inwardly from the inner surface of the cylinder to serve for carrying up the coal, instead of using shelves. These blades or teeth may be of any desired shape. These should be set at such distances apart as only to carry up such pieces of coal as require breaking, leaving the smaller pieces to remain subject to the screening operation; and sectional inclined blades may be used to move the material along, instead of the continuous screw-flange; or the cylinder may be slightly inclined to effect the same object. The feeding-chute should so inclose the end of the cylinder as to catch and return any pieces that scatter as they break, and at the delivery end a disk may be applied within the end to effect the same object, there being the proper space left around the disk for the slate and foreign matter to pass out. A stopper may be applied at the delivery end to retain the contents, and allow them to roll around in contact with each other as they accumulate, and thus break off any remaining pieces of coal, which fall back upon the screen and pass out, together with the pieces of coal scattered in breaking, and this accumulation is discharged periodically by removing the stopper, which may be done automatically.

It is important that the coal shall be supplied with regularity, for which purpose a revolving feeding-screw and cylinder (shown in my application for a patent dated March 21, 1873, and allowed) may be employed, and the

cylinder of this screw may be perforated to act as a screen, and let off any pieces that do not require to be broken.

Where the coal is very wet, with much fine stuff mixed with it, and where it has to be broken very fine, as is frequently the case with bituminous coal, for the purpose of separating the sulphur, either or both the feeder or breaker may be erected in a vat of water, similar to that in my revolving washer patented November 8, 1870, to assist in screening the coal as broken. In this case the cylinder should be in a vat with the water a few inches deep in the bottom of the cylinder.

I claim as my invention—

1. The method of breaking coal by concussion in a revolving cylinder containing lifting shelves or blades and perforations for discharging the coal as broken, substantially as set forth.

2. A revolving cylinder of perforated staves, bound together by hoops, and connected to open heads, in combination with the lifting shelves or blades, the supply-chute, and the delivery-lifter *m*, substantially as set forth.

3. The screw-blade or sectional blades, in combination with the revolving perforated cylinder and lifting shelves or blades, substantially as set forth.

Signed by me this 3d day of April, A. D. 1873.

HEZEKIAH BRADFORD.

Witnesses:

GEO. T. PINCKNEY,  
CHAS. H. SMITH.