F. O. WHITING.

CRUSHER.

APPLICATION FILED APR. 13, 1911.

1,045,763.

Patented Nov. 26, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

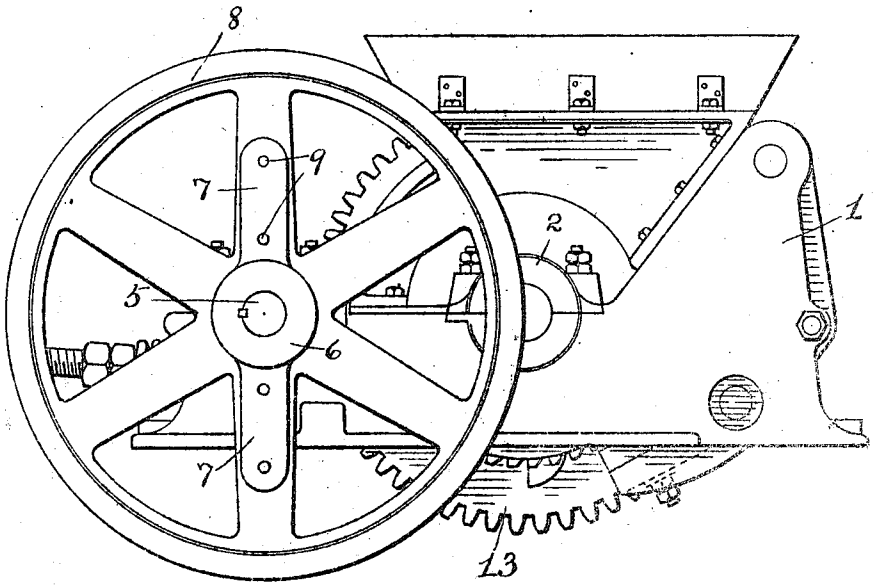

Fig. 11.

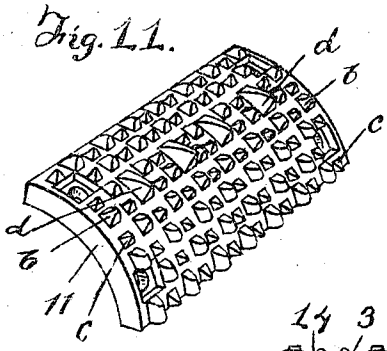

Fig. 2.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

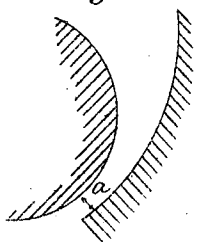


Fig. 4.

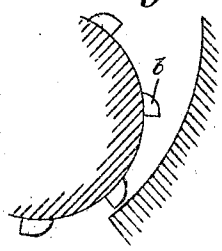


Fig. 5.

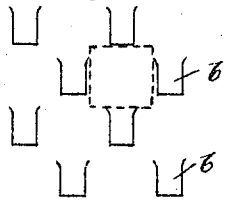


Fig. 6.

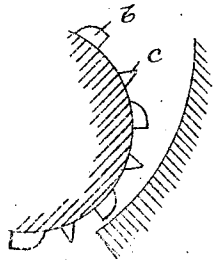


Fig. 7.

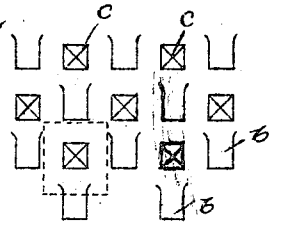


Fig. 8.

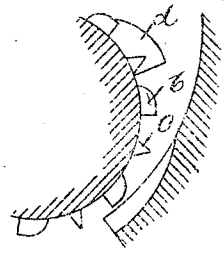


Fig. 9.

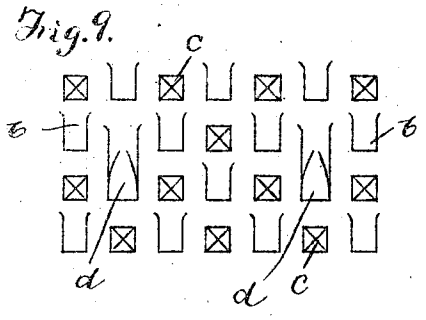
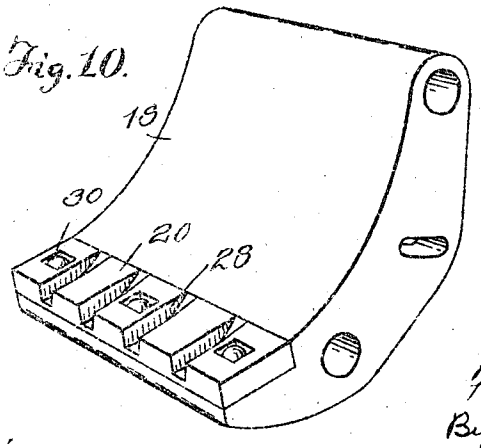


Fig. 10.



Witnesses

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UNITED STATES PATENT OFFICE.

FRANK O. WHITING, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, A CORPORATION OF OHIO.

CRUSHER.

1,045,763. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed April 13, 1911. Serial No. 620,321.

To all whom it may concern:

Be it known that I, FRANK O. WHITING, a citizen of Great Britain, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Crushers, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in crushing machinery and in particular to the type known as a single roll coal crusher.

One object of the invention is the providing of a machine which will handle a large variety of sizes or grades of coal and reduce them to the desired form.

Previously machines of this type have not satisfactorily taken large sizes of coal without making a special adjustment after having used the crusher for smaller grades.

Of the drawings Figure 1 is an end elevation of the machine. Fig. 2 is a vertical transverse sectional view. Figs. 3, 4, 6 and 8 are transverse vertical sectional views through the crusher rolls and breaker plates illustrating the evolution of the hook shaped teeth. Figs. 5, 7 and 9 diagrammatically show the arrangement of the crusher teeth upon the various rolls illustrated in Figs. 4, 6 and 8. Fig. 10 is a perspective view of the breaker plate showing the removable end piece. Fig. 11 is a perspective view of one of the segmental sections of the crusher roll.

Referring to the drawings by characters of reference, the numeral 1 represents the end section of a frame or support upon which the crushing mechanism is mounted. Journals 2 and 3 are provided in these end sections in which are mounted the roll shaft 4 and the counter shaft 5. These journals are provided with the usual removable caps so that the machine may be easily taken apart when so desired. A hub 6 provided with radial wings 7 is keyed to one end of the shaft 5, and in turn is fastened to a pulley wheel 8 by means of pins 9 passed through the wings 7 and arms of the pulley 8. These pins 9 are made of some such material as wood, and their cross section is such that in case of a sudden overload being thrown upon the machine, they will shear, thus disconnecting the counter shaft from the driving element. This provides a safety device such as will eliminate any possible danger of the machine being demolished or the bearings injured, due to sudden and unexpected overloads.

Mounted on the shaft 4 is a drum or roll 10 around the periphery of which is arranged a series of segmental plates 11 on which are formed the crusher teeth. These segmental sections are fastened to the roll 10 by means of radial bolts 12. This roll 10 is driven by a gear 13 mounted on the end of the shaft 4 opposite to the end of the machine on which the pulley wheel 8 is mounted. A pinion 14 is fastened to the end of the counter shaft 5, opposite to that on which the hub 6 is keyed, and engages with the gears 13 thereby furnishing driving means for the crusher roll.

A hopper casing 15 is mounted on the upper portion of the frame and has attached to its ends by means of removable bolts 16 end plates 17 which serve to inclose the upper portion of the roll. This construction provides a removable plate which, when is place, seals the chamber within which the roll operates, thereby preventing escape of dust, and also because of its easy removal, allows access to the bolts 12 so that the segmental sections 11 may be removed without dismantling the entire machine.

A breaker plate 18 is pivoted on a shaft 19 at the upper front side of the machine and is provided at its lower end with a removable plate 20 at the part which lies adjacent the crusher roll. An arcual slot 21 is cut intermediate the ends of the breaker plate and has passing through it a rod 22, the outer ends of which are mounted in the ends of the casing 1. This provides a stop as well as a guide when the breaker plate swings about the pivot shaft 19. A shaft 23 extends through the breaker plate below the arcual slot 21 and has mounted upon its ends two eye bolts 24 which extend rearward through a cross member 25. Springs 26 are placed upon the extremities of the eye bolts 24 outside of the cross member 25 and are retained in place by the nuts 27. This provides a cushioning of the breaker plate so that when an unusually hard piece of material is passed between the roll and the breaker plate, instead of breaking the teeth on the roll or jamming the machine, the breaker plate will be swung back as far as necessary, depending upon the tension placed upon the springs 26.

Referring to Figs. 3 to 9, which illustrates the evolution of the present form of crusher teeth to which this invention relates, Fig. 3 shows the simplest form of the combination of a crusher roll and plate. It is evident that with a roll of this type it would be impossible to crush coal or like material since the friction due to the smooth roll would not be sufficient to feed the material into the throat *a*. To obviate this difficulty, saw teeth *b* are placed upon the roll as illustrated in Figs. 4 and 5, thereby providing means for feeding the material between the roll and the breaker plate. It is necessary that these teeth be spaced considerable distance apart in order that each individual tooth may engage the lumps of coal. The thickness of the product will still be limited to the throat opening at *a*, but it is evident that the machine will pass blocks of a shape roughly indicated by the dotted lines in Fig. 5. While these blocks are no thicker than the throat *a*, yet they are objectionable, as for most uses, it is desirable that the coal be broken into approximate cubes in which it is found to give better satisfaction. To overcome this defect, the pyramidal shaped teeth *c* are placed between the saw teeth *b* as illustrated in Figs. 6 and 7. It is evident that the points of these pyramid teeth *c* will pierce the center of any blocks which would have passed between the teeth *c* and thereby break the coal into the desired cubical form. It is necessary that these teeth *c* be of pyramidal shape for if they were all constructed in the same manner as the saw teeth *b*, their tops would present an almost continuous surface to the material, approximating the original form of roller illustrated in Fig. 3. Likewise it would be impossible to have all of these teeth of pyramidal shape, as then there would be less tendency to feed the coal between the roller and the breaker plate than is now obtained. The result of this construction is satisfactory as to quality, but when large pieces of material are fed the machine, they will have a tendency to roll upon the teeth and not enter the throat *a*. To eliminate this tendency, large hook-shaped teeth *d* are located at intervals as indicated in Figs. 8 and 9. The shape and arrangement of these teeth can best be seen in Fig. 11 and diagrammatically in Figs. 8 and 9. They are of a shape similar to the saw shaped teeth only on a larger scale, extending considerably beyond the other teeth. In the preferred arrangement they are evenly interspaced among the crusher teeth, taking the place of approximately every fourth tooth axially. They are necessarily in circumferential alinement though not necessarily in axial alinement. They are referred to as hook shaped teeth as they extend beyond the ends of the crusher teeth and serve the purpose of hooking the large pieces of coal fed the machine and dragging them down upon the smaller saw and pyramidal shaped teeth. To allow clearance for the large hook-shaped teeth *d*, it is necessary to provide slots 28 in the removable section 20 of the breaker plate that will register with these teeth. This is necessary in order that the throat *a* will not have to be increased any to allow clearance for the hook-shaped teeth. The removable end of the breaker plate 20 is secured to the body of the plate by means of bolts 30 which allow of its easy removal when it is necessary, because of wear or breakage, to substitute a new plate.

What I claim is:—

1. In a coal crushing machine, the combination of a toothed crusher roll, means for rotating said roll, a breaker plate mounted adjacent the roll, and hooked teeth extending beyond the other teeth on the roll, the breaker plate being provided with slots adapted to register with and receive the hooked teeth on the roll, substantially as set forth.

2. In a coal crushing machine, the combination of a toothed crusher roll, means for rotating said roll, a breaker plate mounted adjacent the roll, hooked teeth extending beyond the other teeth on the roll, and a removable plate mounted on the end of the breaker plate adjacent the roll, the said removable breaker plate being provided with slots adapted to register with and receive the hooked teeth on the roll, substantially as set forth.

3. In a coal crushing machine, the combination of a toothed crusher roll, means for rotating said roll, a breaker plate pivotally mounted adjacent the roll, hooked teeth extending beyond the other teeth on the roll, the breaker plate being provided with slots adapted to receive the hook shaped teeth, and resilient means for holding said breaker plate adjacent the roll, substantially as set forth.

4. In a coal crushing machine, the combination of a crusher roll, pyramidal and saw shaped teeth spaced alternately and approximately an equal distance apart axially as well as circumferentially of the roll, means for rotating said roll, a breaker plate mounted adjacent the crusher roll, and a series of hook teeth extending beyond the crusher teeth mounted on the roll and axially spaced approximately in the place of every fourth crusher tooth.

5. In a coal crushing machine, the combination of a crusher roll, pyramidal and saw shaped teeth spaced alternately and approximately an equal distance apart axially and circumferentially of the roll, hook shaped teeth extending beyond the crusher teeth and axially spaced on the roll in the place of ap-

proximately every fourth crusher tooth, means for rotating the roll, and a breaker plate mounted adjacent the roll, the said plate being provided with slots adapted to receive the hook shaped teeth as they rotate past the breaker plate.

6. In a coal crushing machine, the combination of a crusher roll, hook shaped teeth formed on the roll in circumferential alinement, saw shaped and pyramidal teeth of a lesser height interspaced between said hook shaped teeth, means for rotating said roll, and a breaker plate mounted adjacent the crusher roll, the said plate being provided with slots adapted to receive the extended hook shaped teeth as they rotate past the breaker plate.

7. In a coal crushing machine, the combination of a crusher roll, crusher teeth formed on said roll, certain of said teeth in circumferential alinement extended in the form of hook shaped teeth beyond the height of the other teeth, means for rotating the roll, and a breaker plate mounted adjacent the roll, the said plate being provided with slots adapted to receive the hook shaped teeth as they rotate past the breaker plate.

8. In a coal crushing machine, the combination of a crusher roll, and pyramidal and saw shaped teeth spaced alternately and approximately an equal distance apart axially as well as circumferentially of the roll, certain of said teeth in circumferential alinement being extended in the form of hook shaped teeth beyond the height of the other teeth.

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

FRANK O. WHITING.

Witnesses:

DUDLEY T. FISHER,

W. K. LIGGETT.