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BORING AND BREAKER HEAD FOR SLACK COAL

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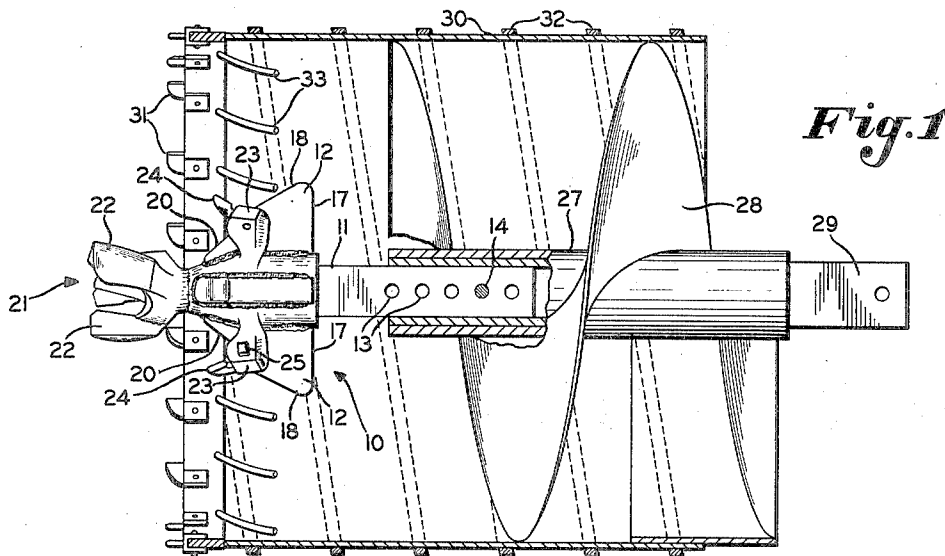
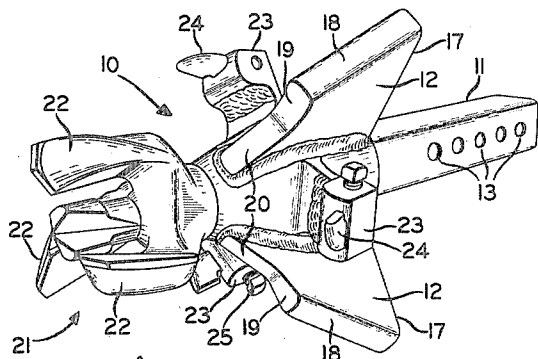
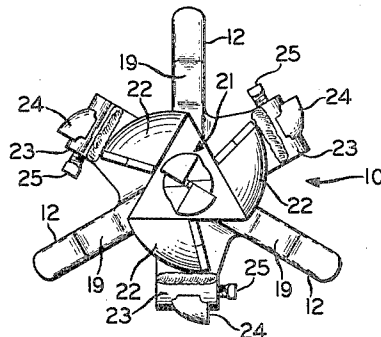
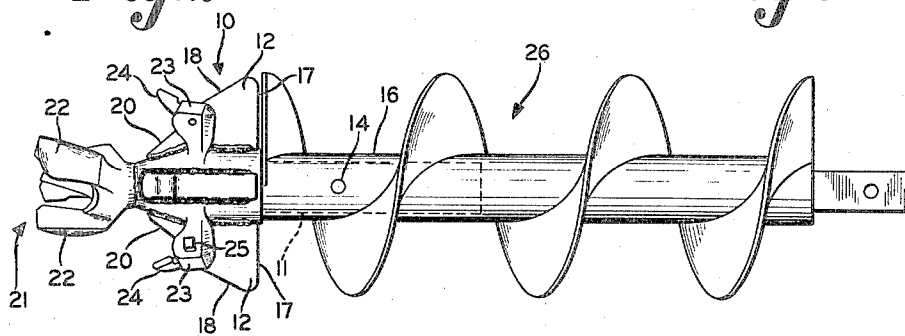


Fig. 4

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BORING AND BREAKER HEAD FOR SLACK COAL

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14 Claims. (Cl. 262—9)

The invention relates to apparatus for the mining of coal, and more particularly to a rotatable boring head adapted to be connected to the forward end of an auger, for boring into a coal seam to break up the coal and remove it from the seam. The boring head may be used as a breaker in a coal mining apparatus of the general type of Joy Patent No. 1,445,085, dated February 13, 1923, comprising generally a tubular cylinder or barrel with cutting bits at its forward end, adapted to be rotated and advanced into a coal seam, and having a central cutting means and a forwardly tapered breaker therein, or the boring and breaker head to which the invention pertains may be used without such cylinder or barrel, being merely attached to the forward end of an auger of suitable diameter to carry away the coal as it is mined by the breaker head.

Mining equipment of the type of the Joy patent above referred to, is adapted for removing the greater portion of the coal in relatively large lumps, while the present boring and breaker head is designed for breaking the coal into relatively small particles, on the order of slack, as it is mined.

An object of the invention is to provide a breaker head having a plurality of radially disposed, triangular fins or vanes tapering toward the forward end of the head, with a plurality of cutting bits centrally located at the lead end of the head.

Another object is to provide such a breaker head in which the peripheral edge of each fin or vane is inclined forwardly to a point spaced from the forward end of the head, and then inclined at a greater angle toward the axis of the head.

A further object is to provide a breaker head of this character in which radially disposed cutting bits are located around the head between the fins or vanes.

A still further object is to provide a breaker head of this type in which the radially disposed cutting bits are located within a circle of less diameter than the maximum diameter of the fins or vanes.

Another object of the invention is to provide such a breaker head in which the radially disposed cutting bits are located adjacent the forward ends of the fins or vanes.

A further object is to provide a breaker head of this character in which the fins or vanes are of extremely heavy and rugged construction.

A still further object is to provide such a breaker head designed to break the coal into small pieces which drop downwardly and are carried rearwardly by the auger.

The above objects together with others which will be apparent from the drawing and following description, or which may be later referred to may be attained by the construction and operation of the improved breaker head as shown on the accompanying drawing and hereinafter described in detail.

In general terms, the invention may be briefly described as comprising a breaker head in the form of a forging of steel or the like having an axial shank for detachable connection to the forward end of an auger or boring head,

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and provided with spaced, radially disposed, triangular fins or vanes of heavy, rugged construction, the peripheral edges of said fins being inclined forwardly toward the axis of the head to a point spaced from the forward end thereof, and then inclined at a greater angle to the axis.

Radially disposed arms are located between the fins and provided at their outer ends with cutting bits, preferably located adjacent to the forward ends of the fins or vanes, and in a circle of less diameter than the rear ends of the fins.

A plurality of cutting bits are attached to the forward end of the breaker head, forming a central cutting means for initially boring into a coal seam in advance of the radial cutting bits and breaker fins.

The improved breaker head may be attached directly to the forward end of an auger section, or may be located in the forward end of a tubular cylinder or barrel, in the manner of the above-mentioned Joy patent.

An embodiment of the invention thus set forth in general terms is illustrated in the accompanying drawing, in which:

Fig. 1 is a longitudinal, sectional view through a "Joy" type mining head, showing the improved breaker head located in the forward end of the tubular cylinder or barrel thereof;

Fig. 2 a detached perspective view of the improved breaker head embodying the invention;

Fig. 3 a front elevation of the breaker head; and,

Fig. 4 a side elevation of the breaker head attached directly to the forward end of an auger section.

Referring now more particularly to the embodiment of the invention illustrated in the drawing, in which similar numerals refer to similar parts throughout, the improved breaker head to which the invention pertains is indicated generally at 10. This breaker head is of rugged construction, and may be in the form of a steel casting or the like, and comprises an axial shank 11 for attachment to an auger section or mining head, and a plurality of (preferably three) radially disposed fins or vanes 12, located forward of the shank 11.

The shank 11 is preferably of square cross section, and is provided with a plurality of longitudinally spaced apertures 13 for selective engagement by a pin 14, by means of which the breaker head may be attached to the forward end of the tubular shaft of a "Joy" type mining head, as shown in Fig. 1, or to the forward end of the tubular shaft 16 of a conventional auger section, as shown in Fig. 4.

Each of the fins or vanes 12 is of relatively heavy construction, and is of substantially triangular shape, having the straight rear edge 17, and the forwardly and axially inclined peripheral edge 18, which is preferably rounded transversely, as best shown in Figs. 2 and 3. At a point spaced from the forward end of the breaker head, the edge of each fin is inclined at a greater angle, as indicated at 19, and then continues to the forward end of the breaker on an angle substantially parallel to the edge 18, as indicated at 20.

A multiple bit, cutter attachment 21, having a circular cluster of bits 22, is attached to the forward end of the breaker head 10, for initially boring into a coal seam, in advance of the breaker head proper, and may be detachably connected to the breaker head in any conventional manner, so that this central cutter may be removed for sharpening or replacement, when necessary.

Radially disposed arms or bosses 23 are formed upon the breaker head, at equally spaced points between the fins or vanes 12, preferably near the forward ends of the peripheral edges 18 thereof, and of less height than the maximum height of the fins. Forwardly and outwardly disposed cutting bits 24 are detachably mounted in the arms or bosses 23, as by the set screws 25.

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As shown in the drawing, these cutting bits 24 are located at substantially the same distance from the forward end of the breaker head as the points 19 where the peripheral edges of the vanes 12 are inclined inwardly, and these cutting bits extend forwardly and outwardly, beyond the peripheries of the vanes at this point, so as to contact the coal seam in advance of the larger rear portions of the vanes 12.

The drilling head 10 may be attached to the forward end of an auger section, as indicated generally at 26 in Fig. 4, by insertion of the shank 11 of the breaker head into the usual socket at the forward end of the auger section and locating a pin 14 through the usual opening provided for this purpose in the auger section and through one of the apertures 13 in the shank.

As the auger is rotated and advanced into the coal seam in usual manner, the central cutting tool 21 will first cut a cylindrical hole into the coal seam, after which the reduced forward ends 20 of the vanes 12 will enter this hole in the coal seam, and as the device is advanced into the coal seam, the coal will be further cut and broken by the bits 24 and the larger rear portions of the vanes 12, the broken coal falling to the bottom of the opening thus formed in the coal seam and being carried rearwardly by the auger 26.

As shown in Fig. 1, the breaker head 10 may be located within the forward end of a boring or mining head of the general type of the Joy patent above referred to. This boring head comprises an auger having the usual tubular shaft 27 surrounded by a spiral flight 28, having the conventional squared shank 29 at its rear end for engagement in the squared socket of a similar auger section, as in usual and well known practice.

A tubular cylinder 30 is disposed around the screw conveyor or flight 28, this cylinder extending forwardly some distance beyond the end of the shaft 27 and spiral flight 28, as shown in Fig. 1, and being provided at its forward end with cutting means comprising a plurality of cutting bits 31 adapted to cut a circular kerf or groove into a seam of coal or other mineral as the boring head is rotated and advanced therein.

If desirable or necessary, a spiral rib or projection 32 may be provided on the exterior of the cylinder 30, for carrying rearwardly chips and dust cut from the coal seam which do not find their way into the inside of the cylinder. Also, if desired, spiral or angular ribs 33 may be provided upon the interior of the cylinder near the forward end thereof.

The shank 11 of the breaker head 10 is attached to the forward end of the shaft 27 of the auger. As the boring or mining head shown in Fig. 1 is rotated and advanced into a coal seam, the peripheral cutting bits 31 at the leading end of the tubular cylinder 30 will cut a circular kerf or groove in the seam of coal producing a cylindrical core of coal.

The central cutting tool 21, at the forward end of the breaker head 10, will bore a central opening into this cylindrical core of coal and will be followed by the reduced portions 20 of the vanes 12 and the forwardly and outwardly disposed cutting bits 24 and the enlarged portions 18 of the vanes 12, cutting and bursting the core of coal into small pieces which drop through the breaker head 10 to the bottom of the cylinder 30 and are conveyed rearwardly by the auger.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the

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construction and operation, and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby; the new and useful construction, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, radially disposed arms extending outwardly from said axial portion between the vanes, cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

2. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, radially disposed arms extending outwardly from said axial portion between the vanes, forwardly disposed cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

3. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, radially disposed arms extending outwardly from said axial portion between the vanes, forwardly and outwardly disposed cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

4. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, to a point spaced from the forward end of the head, then inwardly and then forwardly and inwardly to the forward end of the head, radially disposed arms extending outwardly from said axial portion between the vanes, cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

5. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly to a point spaced from the forward end of the head, then inwardly and then forwardly and inwardly to the forward end of the head, radially disposed arms extending outwardly from said axial portion between the vanes adjacent to said point spaced from the forward end of the head, cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

6. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly to a point spaced from the forward end of the head, then inwardly and then forwardly and inwardly to the forward end of the head, radially disposed arms extending outwardly from said axial portion between the vanes adjacent to said point spaced from the forward end of the head, forwardly disposed cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

7. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly to a point spaced from the forward end of the head, then inwardly and then forwardly and inwardly to the forward end of the head, radially disposed arms extending outwardly from said axial portion between the vanes adjacent to said point spaced from the forward end of the head, forwardly and outwardly disposed cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

8. A rotary drilling head comprising an axial portion, spaced radially disposed vanes extending outwardly there-

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from, the peripheral edges of the vanes being inclined forwardly and inwardly, cutting bits located between said vanes, and an axially disposed cutting tool at the forward end of said head.

9. An auger boring head comprising a rotatable and advanceable tubular cylinder, peripheral cutting means at the forward edge of the cylinder, a breaker head within the cylinder coaxial therewith, said breaker head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, radially disposed arms extending outwardly from said axial portion between the vanes, cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

10. An auger boring head comprising a rotatable and advanceable tubular cylinder, peripheral cutting means at the forward edge of the cylinder, a breaker head within the cylinder coaxial therewith, said breaker head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, cutting bits located between vanes, and an axially disposed cutting tool at the forward end of said head.

11. An auger boring head comprising a rotatable and advanceable tubular cylinder, peripheral cutting means at the forward edge of the cylinder, a breaker head within the cylinder coaxial therewith, said breaker head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, forwardly and outwardly disposed cutting bits located between said vanes, and an axially disposed cutting tool at the forward end of said head.

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12. An auger boring head comprising a rotatable and advanceable tubular cylinder, peripheral cutting means at the forward edge of the cylinder, a breaker head within the cylinder coaxial therewith, said breaker head comprising an axial portion, spaced radially disposed vanes extending outwardly therefrom, the peripheral edges of the vanes being inclined forwardly and inwardly, to a point spaced from the forward end of the breaker head, then inwardly, and then forwardly and inwardly to the forward end of the breaker head, radially disposed arms extending outwardly from said axial portion between the vanes at said point spaced from the forward end of the breaker head, cutting bits upon said arms, and an axially disposed cutting tool at the forward end of said head.

13. A rotatable breaker head comprising an axial portion, an axially disposed cutting tool at the forward end thereof, spaced radially disposed vanes extending outwardly from said axial portion, the peripheral edges of said vanes being inclined forwardly and inwardly, cutting bits located between said vanes at a point intermediate the ends of the breaker head, and an axial shank at the rear end of said axial portion.

14. A rotatable breaker head comprising an axial portion, an axially disposed cutting tool at the forward end thereof, spaced radially disposed vanes extending outwardly from said axial portion, the peripheral edges of said vanes being inclined forwardly and inwardly, cutting bits located between said vanes at a point intermediate the ends of the breaker head and extending outwardly beyond the peripheral edges of said vanes, and an axial shank at the rear end of said axial portion.

References Cited in the file of this patent

UNITED STATES PATENTS

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