

J. E. FLEXNER & E. O'TOOLE.

MINING MACHINE.

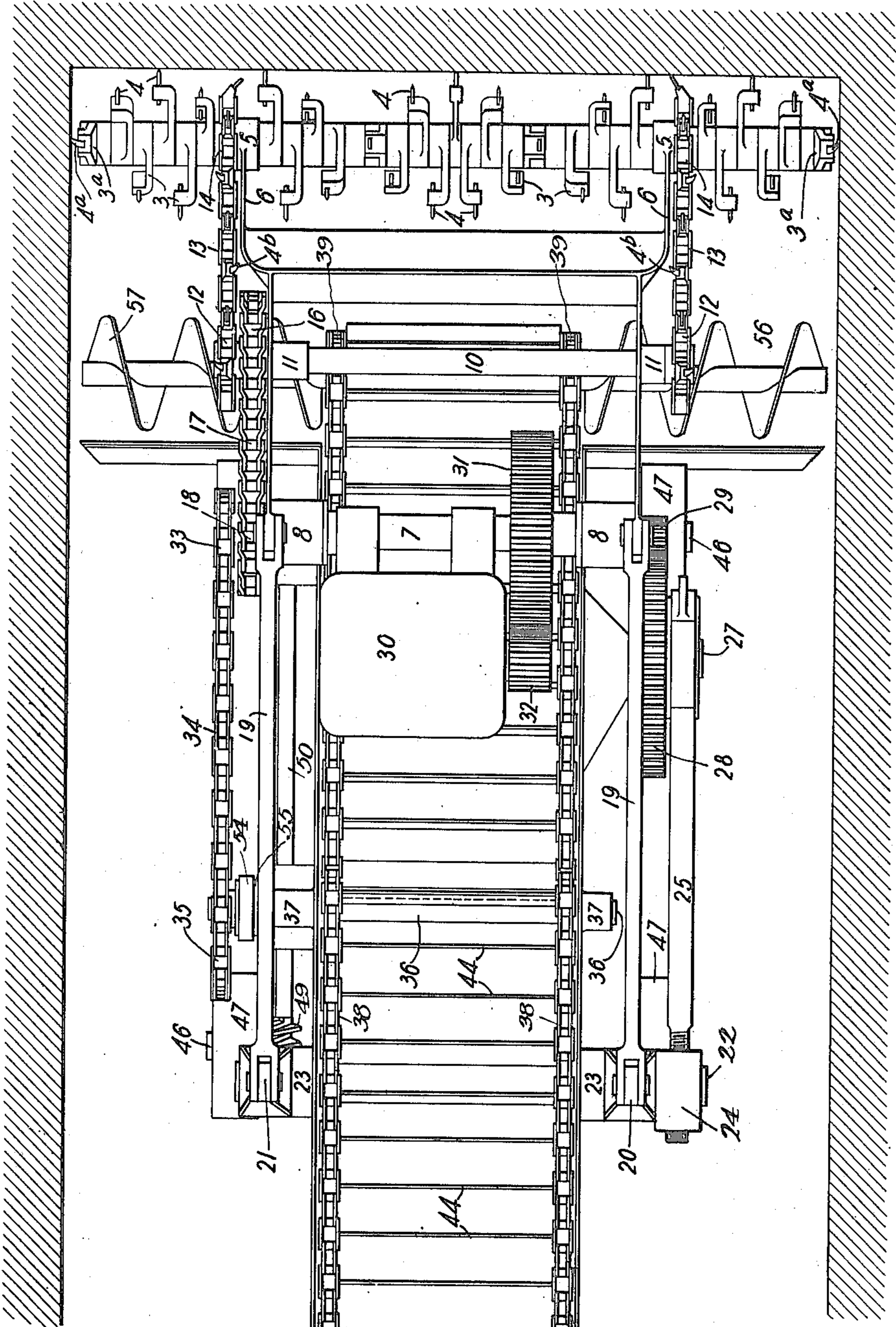
APPLICATION FILED JULY 8, 1912.

1,143,897.

Patented June 22, 1915.

3 SHEETS—SHEET 1.

FIG. 1



WITNESSES

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3 SHEETS—SHEET 2.

FIG. 2

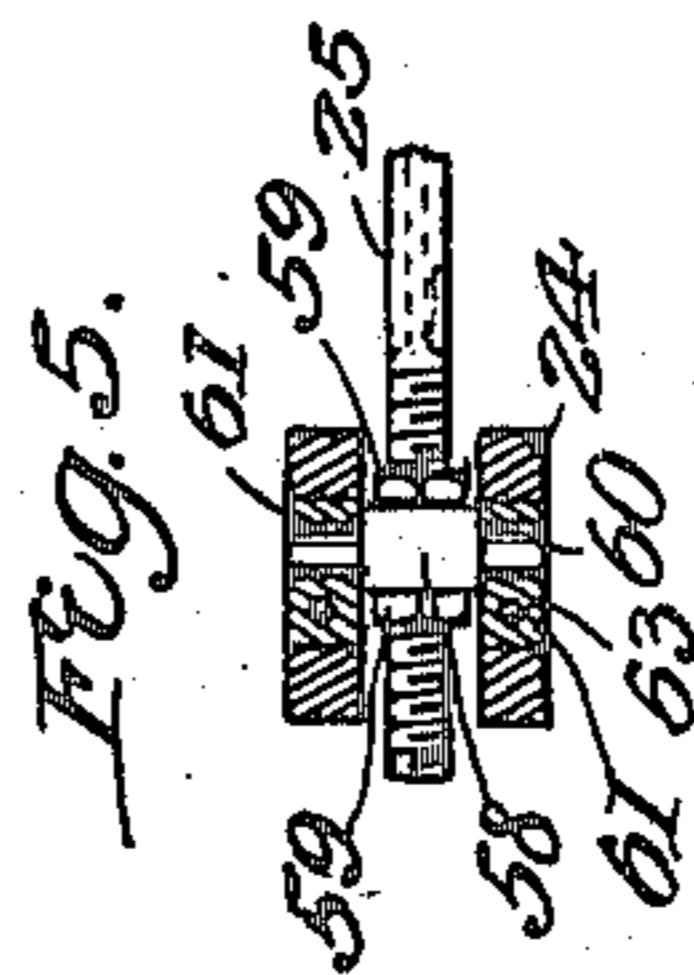
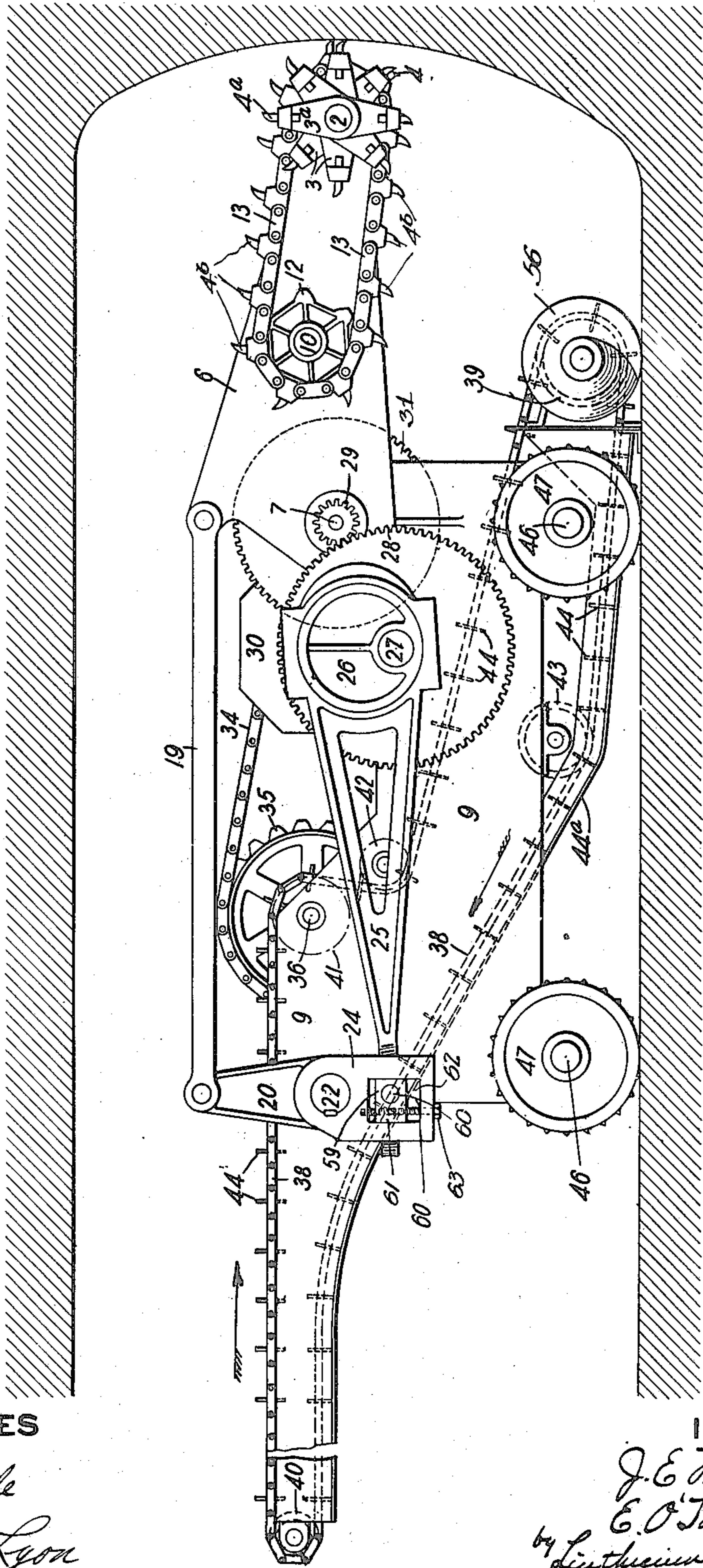


FIG. 5.

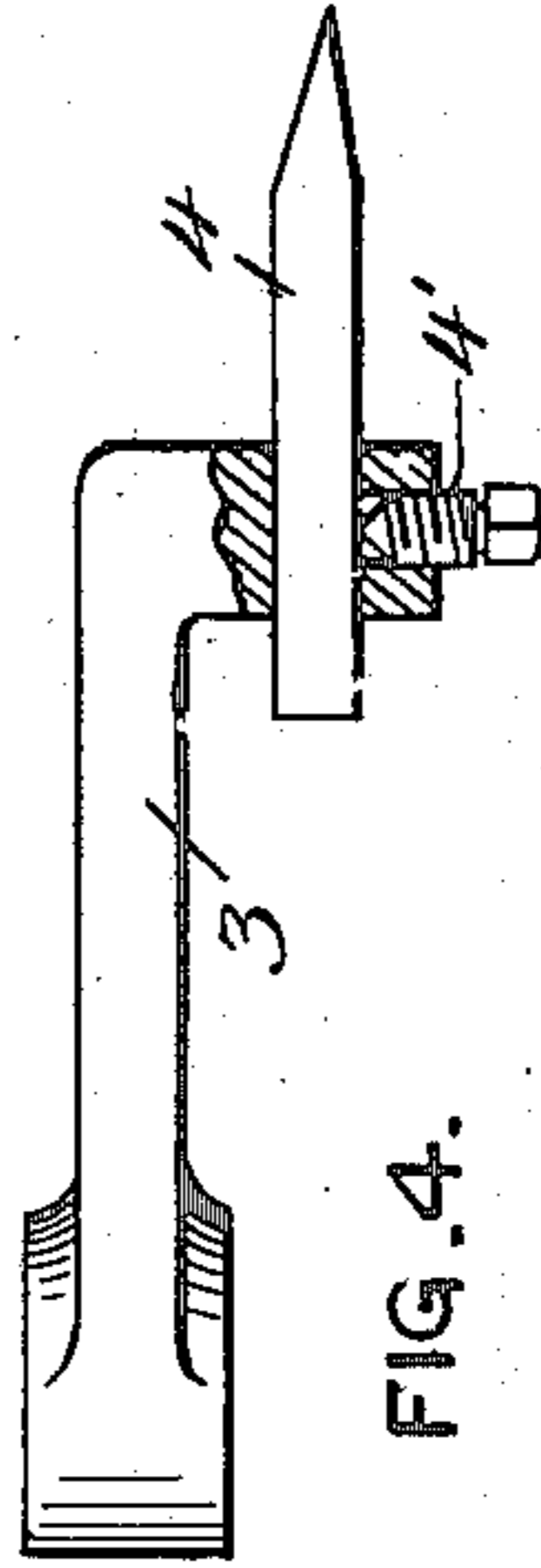


FIG. 4.

WITNESSES

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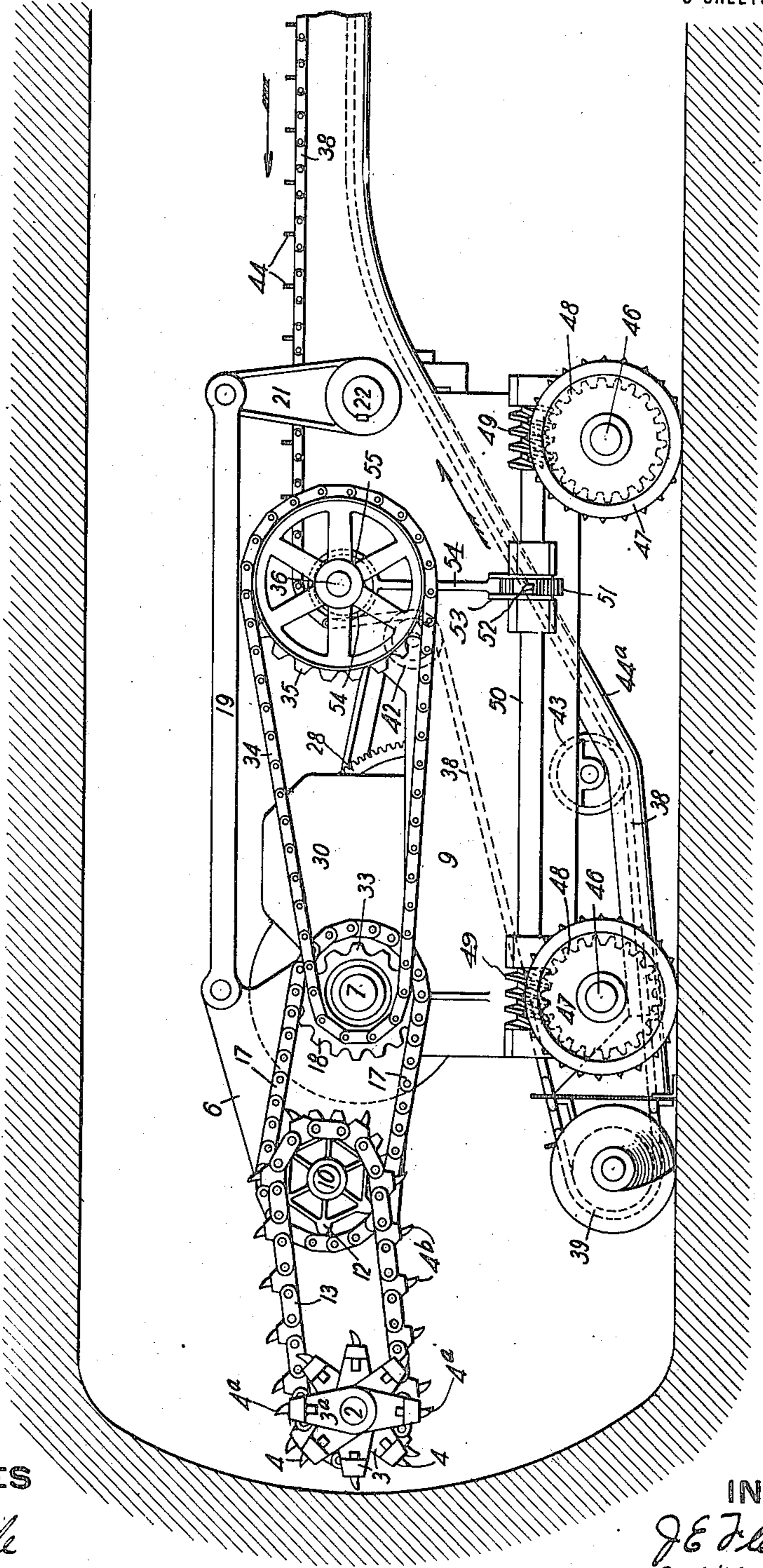
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3 SHEETS—SHEET 3.

FIG. 3



WITNESSES

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# UNITED STATES PATENT OFFICE.

JEFFERSON E. FLEXNER AND EDWARD O'TOOLE, OF GARY, WEST VIRGINIA.

## MINING-MACHINE.

1,143,897.

Specification of Letters Patent. Patented June 22, 1915.

Application filed July 8, 1912. Serial No. 703,122.

*To all whom it may concern:*

Be it known that we, JEFFERSON E. FLEXNER and EDWARD O'TOOLE, citizens of the United States, residing at Gary, in the county of McDowell and State of West Virginia, have invented a new and useful Mining-Machine, of which the following is a specification.

Our invention relates to the class of machines used in mining coal, and more particularly relates to the construction and arrangement of the cutter heads used on and forming part of such coal cutting machines.

One object of our invention is to provide a mining machine having a rotary cutter head mounted thereon constructed and arranged to remove the coal brought into contact with the cutters or picks and to cut the clearance necessary to admit the constantly advancing cutting machine in removing the coal from the vein.

Another object of the invention is to provide a rotating cutter head of novel construction and mounted on the mining machine to oscillate or rock while rotating, in operating on the coal vein so as to cut the clearance necessary to accommodate the coal mining machine and its driving mechanism in the forward movement of the machine during the mining operations.

A further object of this invention is to provide a cutter head adapted for use on a coal mining machine and arranged to move in such manner as will cut the clearance required to permit advancement of the coal handling apparatus by which the coal is removed from in front of the mining machine and maintain the picks or cutters in operative position against the receding face of the coal being mined.

A still further object of the invention is to provide a mining machine having improved means for mechanically removing the coal as mined from in front of to the rear of the machine into mine cars or into position to be placed in mine cars.

Referring to the accompanying drawings forming part of this specification, Figure 1 is a plan showing a coal mining machine having a rotary oscillatory cutter head constructed and applied for use thereto, in accordance with our invention. Fig. 2 is a side elevation of the same, showing the mechanism employed in connecting the motor or other prime mover with the oscillating or rocking arm and rotary cutter head

on the outer end of the arm. Fig. 3 is a similar side elevation of the opposite side of the machine of Figs. 1 and 2, showing the traction wheel driving mechanism. Fig. 4 is a detail plan on a larger scale and partly in section, showing the set screw construction used in adjustably securing the picks on the arms of the cutter head. Fig. 5 is a sectional plan showing a detail of the apparatus.

In the drawings the numeral 2 designates the shaft of a rotary cutter head having a series of radial arms 3. On the outer end of each arm 3 a removable cutter or pick 4 is adjustably secured being held in adjusted position on the arm by a set screw or key 4'.

The entire length of the shaft 2 is provided with the arms 3 which radiate therefrom in relatively staggered relation and the outside arms 3<sup>a</sup> located at the ends of the shaft 2 have the picks 4<sup>a</sup> facing outwardly so as to operate to cut an opening in the face of the coal vein wider than the over all length of the shaft 2, or the widest part of the mining machine and thereby provide the clearance required for the forward movement of the mining machine necessary in continuous mining operations.

The shaft 2 is mounted in bearings 5, 5 on the outer ends of the swinging arms 6 which are pivoted by their other ends on the drive shaft 7 and the shaft 7 is rotatably mounted in bearings 8, 8, on the side frames 9 of the mining machine carriage.

At an intermediate point in the length of the arms 6 a driving shaft 10 is mounted in the bearings 11, 11 and the shaft 10 is provided with sprocket wheels 12 which are connected by means of sprocket chains 13 with the sprocket wheels 14 on the shaft 2 for the cutter head. Alternate links on the sprocket chains 13 are provided with detachable picks or cutters 4<sup>b</sup> which assist the cutters 4, 4<sup>a</sup> in the coal cutting operations when the cutter head is positively driven by the chains 13 in the operation of the mining machine. The intermediate shaft 10 is also provided with a driven sprocket wheel 16 which is connected by the sprocket chain 17 with a driving sprocket wheel 18 on the drive shaft 7.

The arms 6 are pivotally connected by means of links 19 to one end of the lever arms 20 and 21 mounted on opposite sides

of the machine on the ends of the shaft 22, which is secured in bearings 23, 23 provided for that purpose on the frame 9.

On one end of the shaft 22 a lever 24 is provided to which the eccentric arm 25 is adjustably secured, and the other end of the eccentric arm 25 is mounted on the eccentric or cam 26 which is rotatably secured on one end of a stub shaft 27, located on one side of the frame 9. Also mounted on the shaft 27 so as to positively rotate the eccentric 26 is a spur gear 28 which meshes with the spur pinion 29 on the rotary pivot shaft 7 which also serves as a countershaft for the driving motor 30, and a spur gear 31 on the shaft 7 meshes with a spur pinion 32 on the armature shaft of the motor 30. Secured on the opposite end of the pivot or motor countershaft 7 is a sprocket wheel 33, on which is the sprocket chain 34 driving the sprocket wheel 35 on the conveyer drive shaft 36 on which the sprocket wheels 41 are mounted, the shaft 36 being mounted in bearings 37, 37 on the frame 9 of the apparatus.

An endless conveyer, formed by sprocket chains 38, extends around idler sprockets 39 and 40 located on opposite ends of the frame 9 and sprocket wheels 41, 42 and 43 are employed to change the angular direction of travel of the conveyer. Conveyer flights 44 extend transversely between the two lines of the sprocket chain 38 by means of which the cut coal is removed from in front of the mining machine, being pulled thereby over the bottom or floor 44<sup>a</sup> provided between the side members of the frame 9 for that purpose.

The side frames 9 of the carriage are provided with bearings in which the shafts 46 for the traction wheels 47 are mounted and along one side of the frame 9 on the shafts 46 are worm wheels 48, which mesh with the worms 49 on the worm driving shaft 50, by means of which the mining machine is caused to travel forwardly and backwardly into the opening or entry formed by the machine and whereby the machine is held stationary in cutting the coal. A ratchet wheel 51 on the shaft 50 is operatively engaged by a ratchet pawl 52 on the arm 53 pivoted on the shaft 50 and the outer end of the arm 53 is connected by the eccentric arm 54 with the eccentric 55 on the driven shaft 36, so as to operate the pawl 52 in rotating the shaft 50 to revolve the traction wheels 47.

On the shaft for the sprocket wheels 39 at the outer ends thereof, are spiral conveyers 56 and 57, these conveyers being made right and left hand so as to move the cut coal as engaged thereby in front of the machine into position to be engaged by the flights 44 on the coal conveyer and be removed on the conveyer from in front to the rear of the apparatus.

The rear end of the eccentric shaft 25 is screw-threaded and passes loosely through a swivel 58, at opposite sides of which are adjusting nuts 59 to hold the swivel rigidly upon the member 25. This swivel 58 is provided at opposite sides with trunnions 60, each of which is rotatably mounted in a bearing block 61 that is slidably mounted in a slot or guideway 62 in the lower bifurcated portion of the member 24. An adjusting screw 63 passes upwardly through the bottom of each side of the bifurcated member 24 and also through the adjacent bearing block 61, whereby the rear end of the member 25 may be adjusted vertically.

The operation of my improved apparatus is as follows: The parts being assembled, as shown, the motor 30 is started to operate, which through the connecting mechanism causes the shaft 2 for the cutter head to rotate, and which through the connecting gearing also rotates the driving shaft 36 for the flight conveyer, the conveyer moving in the direction of the arrows shown in Figs. 2 and 3. As the motor rotates the eccentric or cam 26 on the shaft 27 is caused to rotate (at a lower speed than the motor) and, through the arm 25 and lever 24 the arms 20 and 21 are caused to rock with the shaft 22 to which the lever 24 is keyed or otherwise secured. The rocking movement of the arms 20, 21 through the links 19 causes the arm 6 to oscillate upwardly and downwardly on the pivot shaft 7 so that the cutters or picks 4 on the cutting head traverse a path defined by the top and bottom of the opening cut in the face of the coal vein in mining the coal. The rotating picks 4 loosen or dig the coal from the face of the vein for a width equal to the distance between the outer faces of the picks 4<sup>a</sup>, 4<sup>a</sup> on the end arms 3<sup>a</sup> mounted on the rotating shaft 2. The picks 4<sup>b</sup> on the sprocket chain 13 also assist in cutting or removing the coal.

The coal as mined drops to the bottom of the entry and the portions thereof falling beyond the sides of the conveyer are engaged by the spiral conveyers 56 and 57 and moved inwardly until in front of the conveyer. As the flights 44 on the endless conveyer successively move around the idler sprocket wheels the coal is moved thereby onto the bottom of the frame 9 and being moved to the rear of the machine on the bottom 44<sup>a</sup> and is discharged over the end of the tail of the frame 9 of the mining machine. The ratchet arm 53 is rocked so as to intermittently rotate the shaft 50 and worms 49 thereon to revolve the traction wheels 47 and in this way move the machine inwardly in the entry and maintain the cutters on the cutter head in operative engagement with the face of the coal vein.

The advantages of our invention will be

apparent to those skilled in the art. By the employment of the oscillating arm for the cutting head the cutting head cuts the clearance for the machine and avoids the necessity of hand labor in providing clearance for the machine in advancing into the entry. The cutter head is mechanically operated to oscillate as it is rotated to remove the coal.

The apparatus is simple and is easily kept in repair.

Modifications in the construction and arrangement of the parts may be made without departing from our invention as defined in the claims.

We claim:—

1. In a mining machine, a frame, a drive shaft journaled on said frame, a driven shaft operatively connected to the drive shaft, arms pivoted concentric to the drive shaft, a rotary cutter bar supported by the arms and operatively connected to said drive shaft, a rock shaft mounted on the frame, rock arms on the rock shaft, links connecting the rock arms and the first-mentioned arms, a lever arm on the rock shaft, a crank

device carried by the driven shaft, and a link connecting the crank device with the lever arm.

2. In a mining machine, a frame, a drive shaft journaled on said frame, a driven shaft operatively connected to the drive shaft, arms pivoted concentric to the drive shaft, a rotary cutter bar supported by the arms and operatively connected to said drive shaft, a rock shaft mounted on the frame, rock arms on the rock shaft, links connecting the rock arms and the first-mentioned arms, a lever arm on the rock shaft, a crank device carried by the driven shaft, a link connected to the crank device, and means adjustably connecting the link and lever arm.

In testimony whereof, we have hereunto set our hands.

JEFFERSON E. FLEXNER.  
EDWARD O'TOOLE.

Witnesses:

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A. E. SHELBURNE.