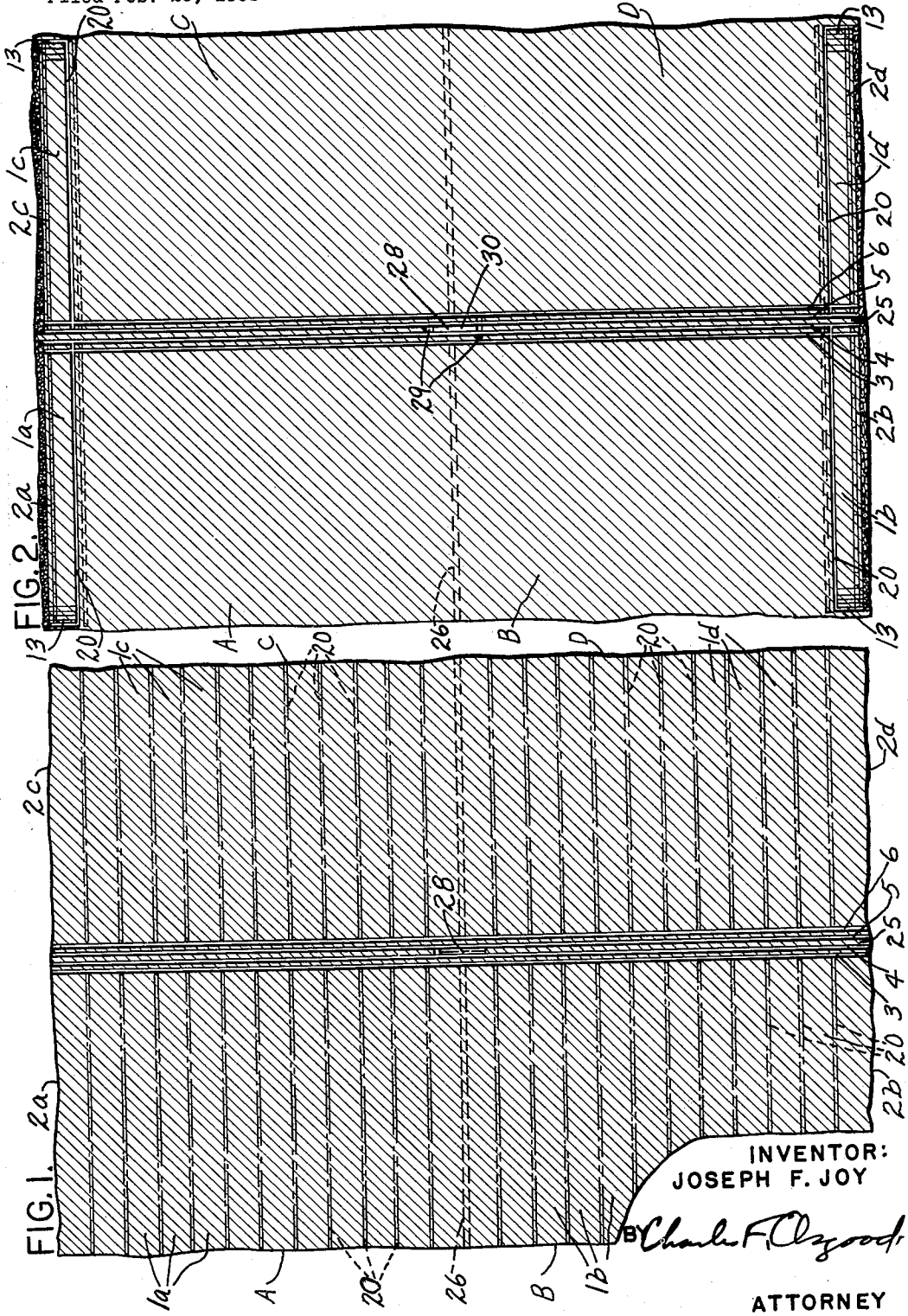
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METHOD OF MINING INVOLVING FOUR ISOLATED SECTIONS

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METHOD OF MINING INVOLVING FOUR ISOLATED SECTIONS

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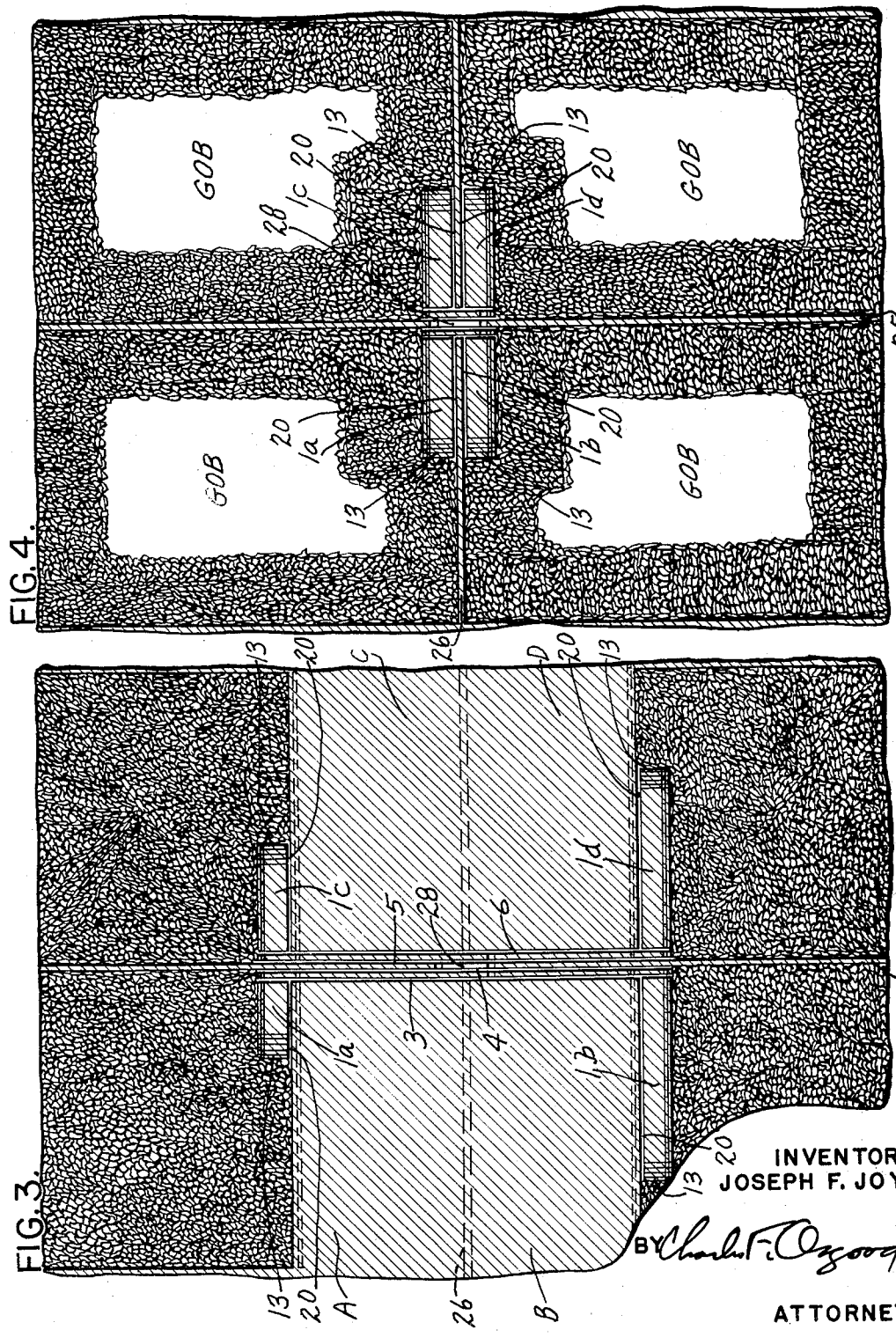


FIG. 4.

FIG. 3.

INVENTOR:
JOSEPH F. JOY

BY Charles F. Osgood.

ATTORNEY

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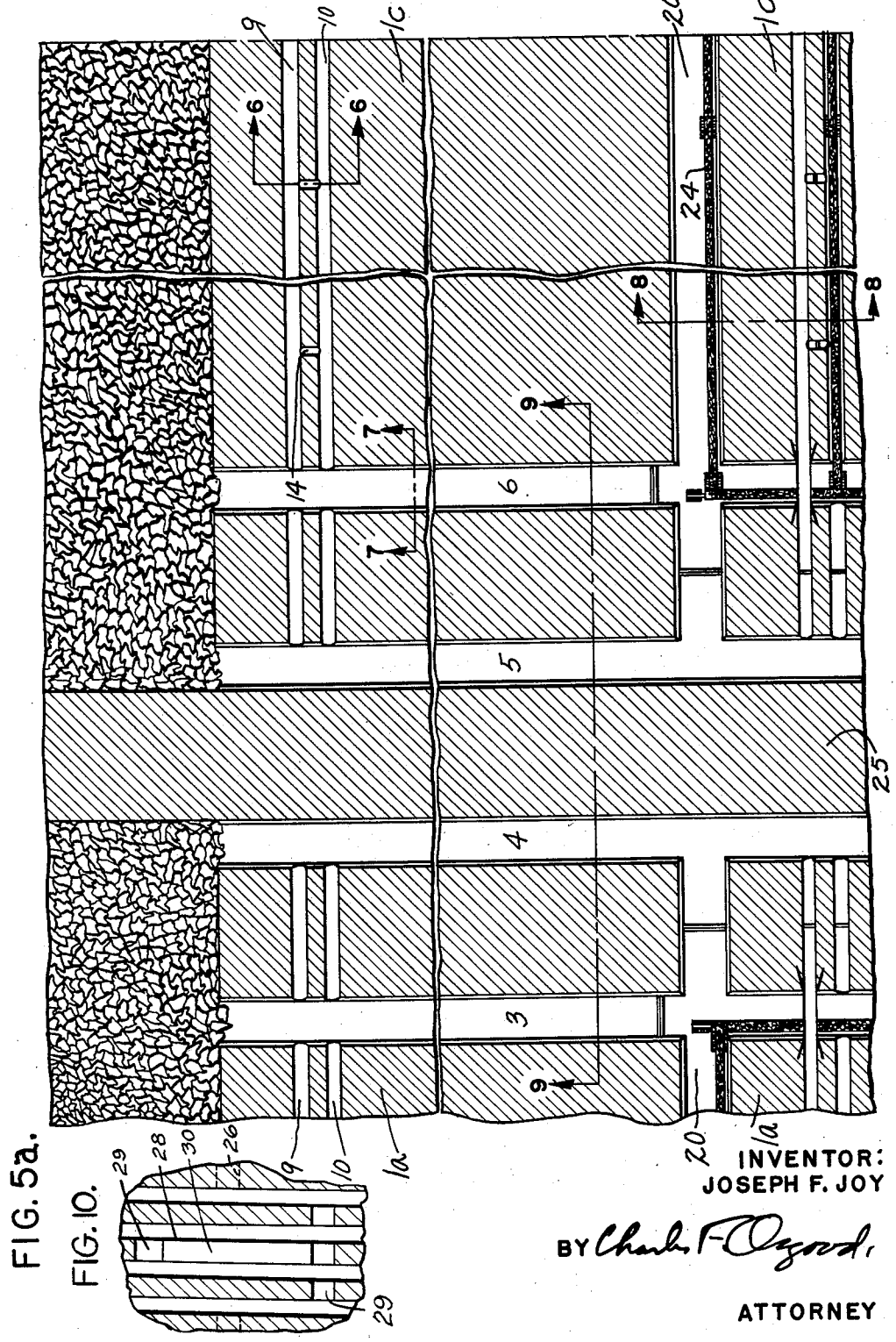


FIG. 5a.

FIG. 10.

INVENTOR:
JOSEPH F. JOY

BY Charles F. Osgood

ATTORNEY

METHOD OF MINING INVOLVING FOUR ISOLATED SECTIONS

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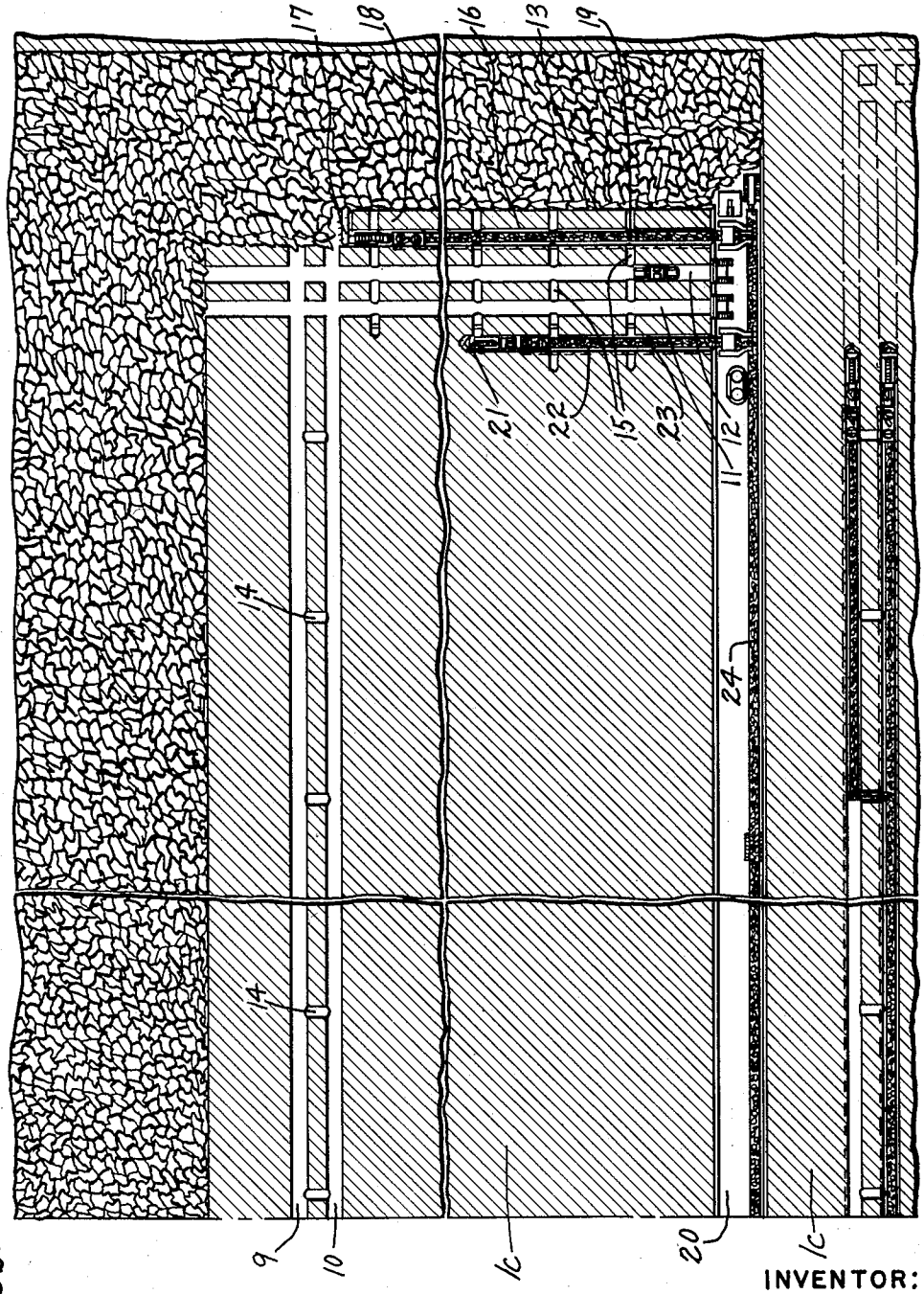


FIG. 5b.

INVENTOR:
JOSEPH F. JOY

BY Charles F. Osgood,

ATTORNEY

Nov. 11, 1958 J. F. JOY 2,859,953

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FIG. 6.

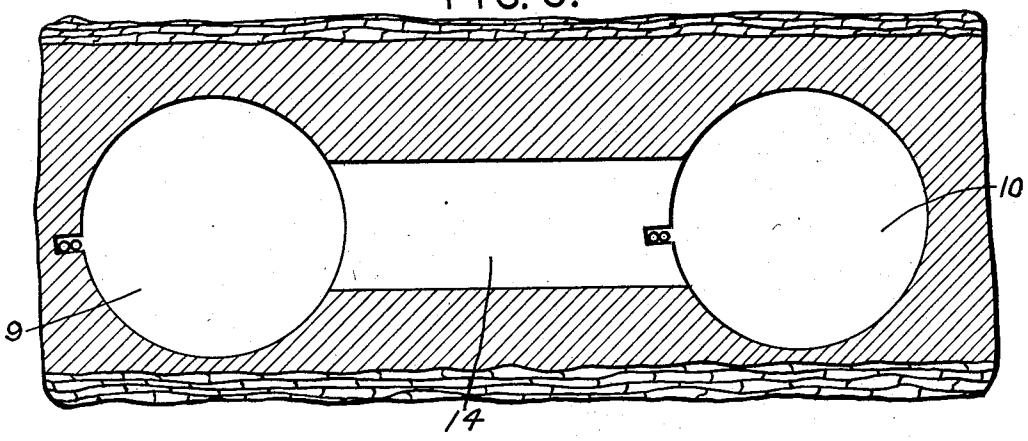


FIG. 7.

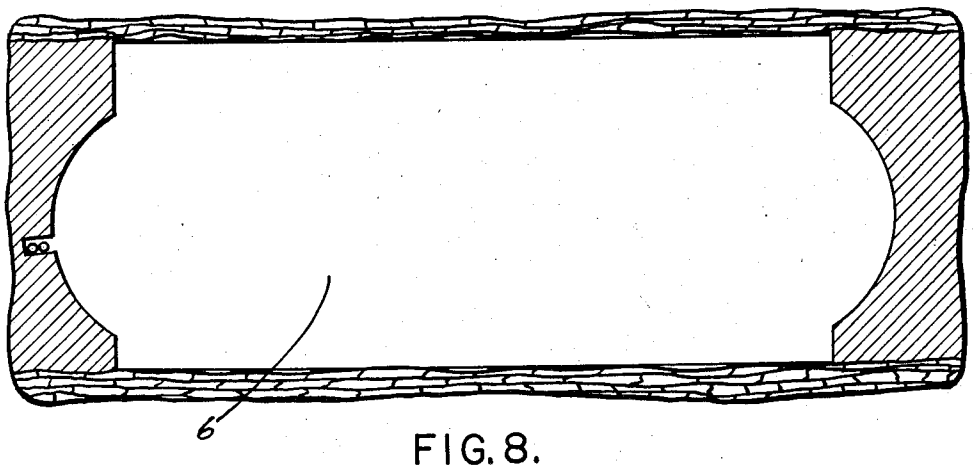


FIG. 8.

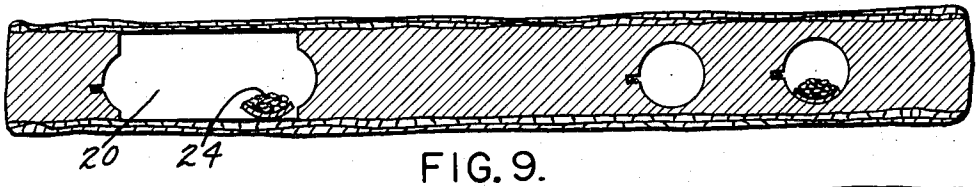
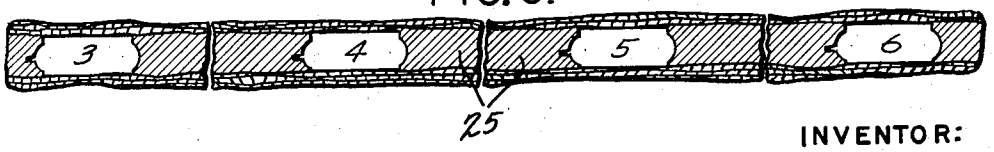


FIG. 9.



INVENTOR:
JOSEPH F. JOY

BY Charles F. Osgood,

ATTORNEY

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2,859,953

METHOD OF MINING INVOLVING FOUR ISOLATED SECTIONS

Joseph F. Joy, Pittsburgh, Pa., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application February 25, 1955, Serial No. 490,657

9 Claims. (Cl. 262—1)

This invention relates to a mining method and more particularly to a method of mining coal in underground mines.

In the retreating longwall system of mining coal as usually employed, the coal heretofore was commonly cut by coal cutting machines, drilled to provide blast holes and then blasted down and loaded out, and more recently coal has been dislodged from a longwall face by a continuous mining machine which removed the coal directly from the solid without the need for drilling and blasting, and special equipment has been provided for loading out the coal produced by this highly productive machine, yet full continuous mining without interruptions has not been achieved. The present invention contemplates improvements in previous methods in that the coal may be mined and loaded out in a substantially continuous manner from the remote faces of isolated productive areas of a mine toward a centrally located point, thereby not only substantially increasing the production of coal but also, at the same time, reducing the hazards and difficulties previously encountered and, as a result thereof, substantially reducing the time consumed in the mining coal. Also, the rate of production from the several productive areas may be regulated to meet the demand.

An object of the present invention is to provide an improved method of mining. Another object is to provide an improved method of mining coal in underground mines whereby production may take place concurrently at widely spaced isolated faces. Still another object is to provide an improved method of mining in accordance with the panel system wherein each panel section is effectively isolated from the others and the productive areas are each independent of the others and yet employ common mine entries and ventilation systems. Yet another object is to provide an improved method of mining coal in accordance with the full retreat longwall ssytem requiring that initial development work be carried to the boundaries of the coal field or mine acreage in order that productive mining may begin at the four remote corners of the property. A still further object is to provide an improved mining method in accordance with the panel system wherein the productive areas may be located at the four remote corners of the coal field at isolated points and production may be carried on concurrently or separately at such points. Other objects will become apparent to those skilled in the art as the description proceeds.

In the accompanying drawings which illustrate the improved method of mining coal;

Fig. 1 is a somewhat diagrammatic horizontal section showing a coal field or section to be mined out, with the numerous panels indicated in broken lines, and showing the main entries and upcast shaft.

Fig. 2 is a horizontal diagrammatic section, similar to Fig. 1, showing the four isolated productive areas which are connected at remotely separated points by the mine entries.

Fig. 3 is a horizontal diagrammatic section, showing the coal field or acreage partially mined out.

Fig. 4 is a horizontal section, similar to Fig. 3, showing the coal field or acreage with the coal almost completely mined out.

Figs. 5*a* and 5*b*, taken together, constitute an enlarged horizontal sectional view of a pair of adjacent panels showing the productive areas at one boundary of the coal field.

Fig. 6 is an enlarged vertical section, taken on line 6—6 of Fig. 5*a*, showing a pair of horizontal ventilating bores parallel with the working face of a productive area.

Fig. 7 is an enlarged vertical section through one of the mine entries, taken on line 7—7 of Fig. 5*a*.

Fig. 8 is a vertical section, somewhat enlarged, taken on line 8—8 of Fig. 5*a*.

Fig. 9 is enlarged vertical section taken on line 9—9 of Fig. 5*a*, showing the parallel mine entries.

Fig. 10 is an enlarged section showing the central portion of Fig. 2.

In connection with the description of the improved mining method, attention is asked to my copending applications, Serial No. 296,323 relating to Method of Mining Coal, now abandoned, and Serial No. 296,327 relating to Method of Ventilating the Productive Areas of a Coal Mine, both filed on June 30, 1952.

Referring first to Fig. 1 of the drawings which shows the hypothetical coal field or mine acreage involved in the present method, it will be noted that the field is rectangular in shape and is divided into four quarter-sections, or equal sections, designated A, B, C and D and in order to comprehend the size of the area involved it might be stated that the field may extend to a width of two miles or more and to a length of nearly three or more miles, although the exact limits of the perimeter of the field are of little importance insofar as the present invention is concerned. Each quarter-section is shown divided by construction lines into a series, herein for illustrative purposes shown as twelve, of rectangular panels and the panels of the four sections are respectively designated 1*a*, 1*b*, 1*c* and 1*d*, and the four productive areas are respectively designated 2*a*, 2*b*, 2*c* and 2*d*. Extending centrally lengthwise of the field are four parallel main entries designated 3, 4, 5 and 6, and these are shown on a larger scale in Figs. 5*a* and 5*b* and in cross section in Fig. 9. These main entries may be formed in various manners by machines of various types but are herein desirably formed by drilling parallel horizontal bores by a boring machine or bore miner of the kind disclosed in my copending application Serial No. 296,324, filed June 30, 1952, now Patent No. 2,822,159, and by cutting away the dividing sprag by a sprag cutter or sprag miner as disclosed in my copending application Serial No. 296,325, filed June 30, 1952, now Patent No. 2,796,246.

As shown in Figs. 5*a* and 5*b*, parallel horizontal ventilating bores 9 and 10 extend across the main entries 3, 4 and 5, 6 in parallelism with the sides of the rectangular panel being mined out and these bores open into horizontal bores 11 and 12 extending in parallelism with each working face 13. A series of horizontal break-throughs or drill holes 14 connect the parallel bores 9 and 10 while similar horizontal break-through holes 15 extend between the bores 11 and 12 and a bore 16 extending in parallelism with the bores 11 and 12 and with the working face inside of the latter (Fig. 5*b*). A sprag miner 17 is shown operating in the bore 16 for cutting away the sprag of coal 18 and a conventional conveying means 19 extends outwardly through the bore 16 to a panel entry 20 arranged parallel with the bores 9 and 10. The break-through holes connect the bore 16 with the ventilating bores 11 and 12 and a bore miner 21 is shown forming a fourth bore 22 parallel with and inside of the bore 11. A similar conveyor 23 in the bore 22 extends outwardly through the bore for conveying away the cuttings discharged from

the bore miner and the conveyors 19 and 23 discharge onto a conveyor 24 extending outwardly through the panel entry 20. As the sprag miner 17 cuts away the sprag 18 at the production area, the roof may gradually subside and when the sprag is completely mined out, the sprag miner may then operate in the next adjacent parallel bore 12 to mine out the next adjacent sprag, all in the manner fully disclosed in my copending application Serial No. 296,323, above referred to.

The parallel bores of the entries 4 and 5 leave therebetween an unbroken division pillar 25 while extending transversely, midway between the ends of the coal field, is a division pillar 26 indicated in broken lines in Figs. 1 and 2. The four main entries 3, 4, 5 and 6 extend in parallelism with the longitudinal division pillar 25 and the panel entries, indicated in broken lines at 20, in Fig. 1, are bored transversely in parallelism with the transverse division pillar 26 to form the series of panels. It will thus be seen that the rectangular coal field has been divided into four equal sections, each isolated from the others by the division pillars 25 and 26 which extend unbroken between the central portion of the coal field and the productive areas 2*a*, 2*b*, 2*c* and 2*d*. The two inner parallel mine entries 3 and 4, as shown in Fig. 2, communicate with a centrally located upcast shaft 28 and right-angle openings 29 connect the main entries 3, 4 and 5, 6 at the shaft. Also located in adjacency to the upcast shaft near the point of intersection of the division pillars is a downcast air and conveyor slope 30.

The series of rectangular panels are successively mined out in the manner described above and as the panels are removed, the roof is allowed to subside and, in Fig. 3, nearly half of the field is shown mined out, while in Fig. 4 mining out of the field is nearly complete.

From the foregoing, it will be evident that, in accordance with the novel method above described, the coal is mined out by the full retreat longwall system so that initial development work may be carried from the center of the coal field to the remote boundaries of the field in order that productive mining might begin at the four remote corners of the rectangle, and the series of panels of the four equal sections A, B, C and D of the field may be progressively removed in directions toward the transverse division pillar 26, as shown in Fig. 3, and in Fig. 4, the four equal sections are shown nearly completely mined out. The mined coal is conveyed from the mine along the slope at the center of the field.

By the provision of the longitudinal and transverse division pillars 25 and 26 extending between the centrally located shaft 28 and the productive areas 2*a*, 2*b*, 2*c* and 2*d* and the particular arrangement of the mine entries, the transverse bores separating the panels, the ventilating bores and the production bores, it is possible to remove the coal from the four productive areas simultaneously. By the formation of the various mine passages by the boring method, the curved roof structure left by the bores minimizes, if not entirely eliminates, the need for roof-supporting timber or roof supports at the productive areas.

In the event that full production of the coal field at the four productive areas is unnecessary to meet the demand, the four working faces may be separately worked independently of the others. The longitudinal and transverse division pillars 25 and 26 separate the four equal sections of the field between the four productive areas and the centrally located shaft so that the four productive areas are each substantially isolated from the others, thereby to a large degree localizing the effect of explosions, due to the fact that gas-laden air from the productive area of one section cannot possibly mix with the ventilating air of the productive areas of the other sections. By the separation of the field into four equal sections by the longitudinal and transverse division pillars 25 and 26, the four productive areas or sections, in effect, constitute four separate coal mines each independent of the other.

While the bore and sprag miners of my copending applications Serial Nos. 296,324 and 296,325 have been employed in the formation of the bores and entries and for removing the coal from the productive areas, it will be evident that the various mining operations may be performed by machines of other types, as for example, by the machines of my copending applications Serial No. 325,652, filed November 6, 1950, now Patent No. 2,769,627, Serial No. 214,242, filed March 7, 1951, now Patent No. 2,730,346, and Serial No. 405,853, filed January 25, 1953. Moreover, since the particular method of removing the coal at the productive areas and the method of ventilation of the productive areas do not per se enter into the present invention, the actual mining out of the coal and ventilating of the mine may be effected in accordance with other known methods.

While there is in this application specifically disclosed the improved method by which the invention may be practiced, it will be understood that this is shown for purposes of illustration and that the invention may be practiced in other manners without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A method of mining coal comprising laying out a coal field in four equal sections, forming passages in the coal to provide division pillars, one extending centrally longitudinally of the field and the other extending centrally transversely of the field, with the pillars extending unbroken from the central portion of the field to the remote boundaries of the four sections for substantially isolating the four sections from each other, dividing each section into a series of panels, and progressively removing the panels from the outer boundaries of the field in directions toward the transverse division pillar.

2. A method of mining coal as set forth in claim 1 wherein the coal is removed by the full retreat system with the initial development work carried from the point of intersection of said division pillars to the remote boundaries of the field.

3. A method of mining coal as set forth in claim 2 wherein an upcast shaft and a downcast air and conveyor slope are formed at the center of the field near the point of intersection of the division pillars and production of coal from the panels takes place in directions toward said shaft and slope.

4. A method of mining coal comprising laying out a coal field in four equal sections, separating the four equal sections by longitudinal and transverse division pillars intersecting at a point located centrally of the field and extending from the vicinity of said centrally located point to the remote boundaries of the field for substantially isolating each section from the others, dividing each section into a series of rectangular panels, and mining out the panels from the remote boundaries of the field in directions toward the transverse division pillar.

5. A method of mining coal as set forth in claim 4 wherein an upcast shaft and downcast slope are formed near the point of intersection of said division pillars.

6. A method of mining coal as set forth in claim 4 wherein parallel mine entries extend longitudinally between the pairs of sections at the sides of the field, and ventilating air passages are formed to extend from the entires to the faces of the productive areas, the longitudinal division pillar completely separating an entry at one side of the field from an entry at the other side thereof.

7. A method of mining coal comprising dividing a rectangular coal field into four equal sections, separating the four sections by longitudinal and transverse division pillars which intersect at the center of the field and extending from the vicinity of the center of the field to the outer boundaries of the field for substantially isolating each section from the others, dividing each of the four sections into a series of panels, and progressively remov-

ing the panels from the outer boundaries of the field in directions toward the transverse division pillar.

8. A method of mining coal comprising dividing a rectangular coal field into four equal sections, dividing the four sections by longitudinal and transverse division pillars extending unbroken between the vicinity of the central portion of the field and the outermost working face of the sections for substantially isolating each section from the others, and mining out the coal from the outermost working faces of the sections in directions toward the transverse division pillar.

9. A method of mining coal as set forth in claim 8 wherein the mined out coal is conveyed from the mine at the center of the field near the inner ends of the division pillars.

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