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COOPERATIVE AGREEMENT

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State Geological Survey
Department of Mining Engineering, University of Illinois
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BULLETIN 7

# Coal Mining Practice
IN
# District II


BY

S. O. ANDROS

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The Forty-seventh General Assembly of the State of Illinois, with a view of conserving the lives of the mine workers and the mineral resources of the State, authorized an investigation of the coal resources and mining practices of Illinois by the Department of Mining Engineering of the University of Illinois and the State Geological Survey in co-operation with the United States Bureau of Mines. A co-operative agreement was approved by the Secretary of the Interior and by representatives of the State of Illinois.

The direction of this investigation is vested in the Director of the United States Bureau of Mines, the Director of the State Geological Survey, and the Head of the Department of Mining Engineering, University of Illinois, who jointly determine the methods to be employed in the conduct of the work and exercise general editorial supervision over the publication of the results, but each party to the agreement directs the work of its agents in carrying on the investigation thus mutually agreed on.

The reports of the investigation are issued in the form of bulletins, either by the State Geological Survey, the Department of Mining Engineering, University of Illinois, or the United States Bureau of Mines. For copies of the bulletins issued by the State and for information about the work, address Coal Mining Investigations, University of Illinois, Urbana, Ill. For bulletins issued by the United States Bureau of Mines, address Director, United States Bureau of Mines, Washington, D. C.

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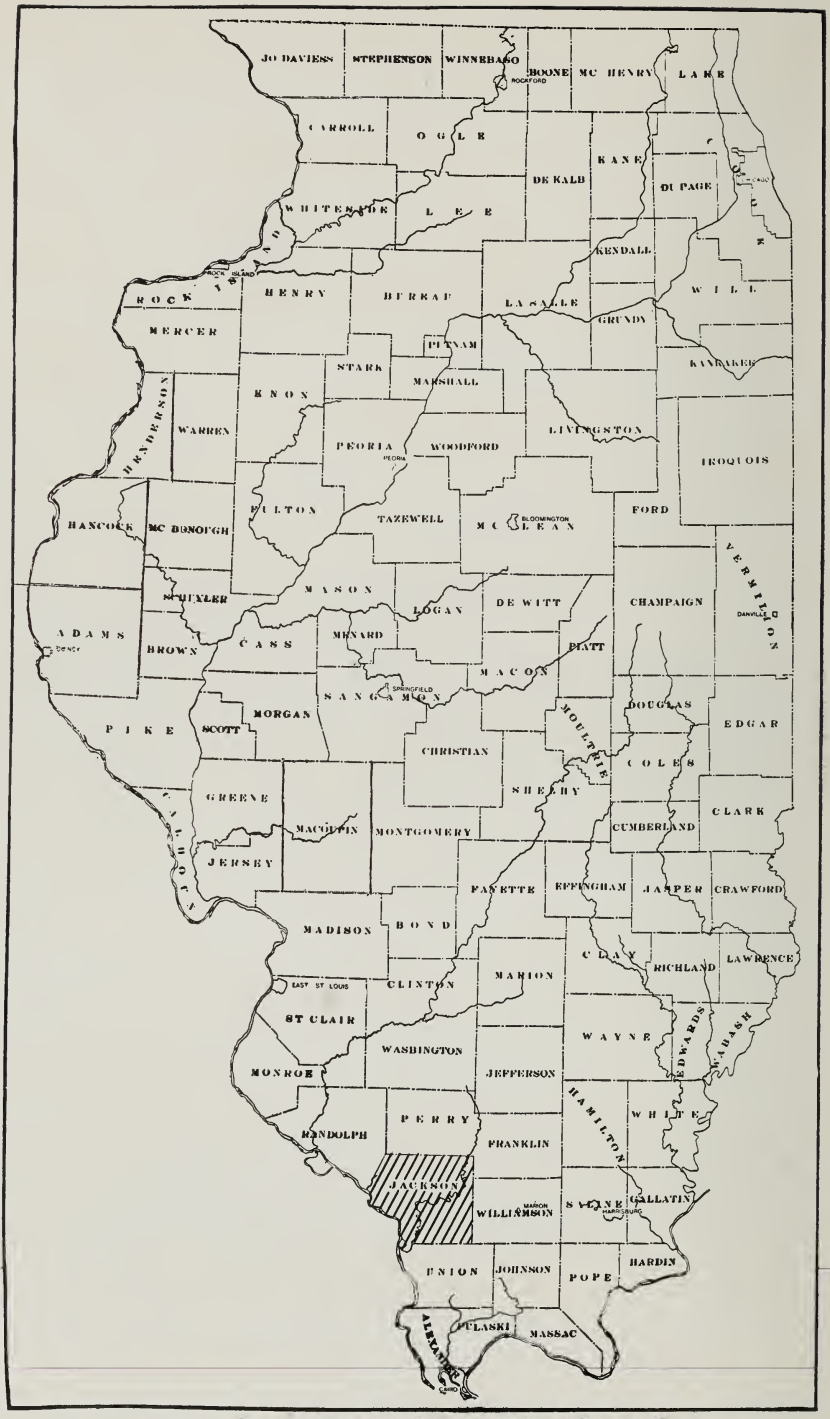


FIG. 1. Map Showing the Area (Shaded) of District II

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# COAL MINING PRACTICE IN DISTRICT II

By S. O. ANDROS

## INTRODUCTION

District II of the Illinois Coal Mining Investigations, as shown in fig. 1, comprises those mines in Jackson County which produce coal from bed 2 of the Illinois Geological Survey correlation. A detailed description of the districts into which the State has been divided and the method of collecting the data upon which this bulletin is based is contained in Bulletin 1, "A Preliminary Report on Organization and Method."

The physical characteristics of the coal bed and the mining practice of this district differ from those in districts in northern and northwestern Illinois, where bed 2 is also mined. The district properly cannot be considered a part of any other in southern Illinois because in the other southern districts either bed 5 or bed 6 is mined. Therefore, it is necessary to treat this restricted area—although it has few mines and a small production—in a separate bulletin.

The first historical record of coal mining in Illinois refers to a flatboat load of coal mined in 1810 at a point on the Big Muddy River in Jackson County. One of the eight mines now operating in the district was opened about forty years ago; the other seven have been in operation from seven to nine years. The total production of coal during the year ended June 30, 1912, was 500,102 short tons, 0.9 per cent of the total production of the State. This coal was nearly all undercut, 479,779 tons—95.9 per cent—of the total output having been mined by machines. Machine mining has resulted in a low powder consumption. During the year ended June 30, 1912, 4,566 kegs of powder, 0.3 per cent of the total for the State, were used for blasting coal in the district.

The mines employed an average of 750 men for an average of 156 days.

Table 1 gives comparative statistics for the District and for the State during the year ended June 30, 1912.

TABLE 1.—*Comparative statistics for District II and the State for the year ended June 30, 1912*[a]

| | District | State | Per cent |
|---|---|---|---|
| Total production | 500,102 | 57,514,240 | 0.9 |
| Tons mined by machine | 479,779 | 25,550,019 | 1.9 |
| Average daily tonnage | 3,206 | 359,464 | .... |
| Kegs of powder used in blasting coal | 4,566 | 1,313,448 | 0.3 |
| Days of active operation | 156 | 160 | .... |
| Total employees | 750 | 79,411 | 0.9 |
| Days work performed | 117,000 | 12,705,760 | 0.9 |
| Surface employees | 97 | 7,049 | 1.3 |
| Underground employees | 653 | 72,362 | 0.9 |
| Average number of face workers (miners, loaders, and machine men)[b] | 441 | 43,308 | 0.8 |
| Underground employees per each surface employee | 6.7 | 10.3 | .... |
| Tons mined per day per employee | 4.3 | 4.5 | .... |
| Tons mined per day per surface employee | 33.0 | 50.9 | .... |
| Tons mined per day per underground employee | 4.9 | 4.9 | .... |
| Tons mined per day per face worker[b] | 7.3 | 6.1 | .... |
| Fatal accidents | 0 | 180 | .... |
| Non-fatal accidents | 8 | 800 | 1.0 |
| Per cent from falling coal or rock | 35.7 | 45.5 | .... |
| Per cent from pit-cars | 25.0 | 26.3 | .... |
| Injuries per 1000 employees | 10.7 | 10.1 | .... |
| Tons mined to each man injured | 62,513 | 71,893 | .... |

a. Compiled from Thirty-first Annual Coal Report of Illinois.
b. Shipping mines only.

Thanks are due to the operators of this district for granting permission to inspect their mines and to the superintendents and mine managers who assisted in collecting data. Special acknowledgments should be made to Mr. John McClintock, State Mine Inspector, and to Mr. Thomas Little, former State Mine Inspector, for their valuable assistance.

## DESCRIPTION OF COAL BED

Bed 2 in Jackson County has only a shallow cover, the coal lying at depths varying from 25 to 160 feet at different mine locations. A characteristic feature of the bed is its division into two benches by a gray laminated shale band varying in thickness from $\frac{1}{8}$ inch to 36 feet. Where this parting is thick the lower bench has sometimes been called, erroneously, bed 1. The bottom bench varies in thickness from $3\frac{1}{2}$ to 4 feet, averaging $3\frac{3}{4}$ feet. The top bench averages 2 feet.

The bed contains few nodular concretions of iron pyrites, but has a layer of bone 2 to 3 inches thick, generally next to the floor. This floor in most places is sandstone, but in sections is shale or fireclay. The coal shows a pronounced cleavage, northeast to southwest.

The chemical composition and calorific value of No. 2 coal as found in District II vary considerably from those of the coal of the same bed in District I, comprising Bureau, Grundy, LaSalle, Marshall, Putnam, Stark and Will Counties. A comparison between the coals of these districts is given in Table 2.

TABLE 2.—*Analyses of No. 2 coal in District I and II*[a]

| District | No. samples | Proximate analysis of coal: 1st; "As rec'd," with total moisture 2nd; "Dry," or moisture free | | | | Sulphur | B. t. u. | Unit coal B. t. u. |
|---|---|---|---|---|---|---|---|---|
| | | Moisture | Volatile matter | Fixed carbon | Ash | | | |
| I | 33 | 16.18 | 38.83 | 37.89 | 7.08 | 2.89 | 10981 | ..... |
| | | Dry | 46.33 | 45.21 | 8.45 | 3.45 | 13101 | 14528 |
| II | 15 | 9.28 | 33.98 | 51.02 | 5.72 | 1.29 | 12488 | ..... |
| | | Dry | 37.46 | 56.24 | 6.30 | 1.42 | 13765 | 14818 |

a. Analyses made by J. M. Lindgren under the direction of Prof. S. W. Parr

The superiority of the coal in District II is apparent. It has less volatile matter, more fixed carbon, less ash and moisture, and a higher calorific value than the coal of District I.

The small amount of gas given off by the bed is usually found only in abandoned workings.

Where the parting is thin and the two benches are united, the roof over the coal is a hard gray shale, but where the parting is thick and only the lower bench is worked the parting becomes the roof.

Where this parting is a light gray shale it is easy to support; where it is dark colored it slakes much on exposure to the air.

In all the mines of this district numerous small faults occur and horses, usually of a hard dark gray micaceous sandstone, are found in the vicinity of the faults.

The presence in places of a quicksand deposit about thirty feet below the surface has a marked effect on surface subsidence after roof-caves.

TABLE 3.—*Pressures developed by face samples in explosibility apparatus*

| District | No. samples | Pressure in pounds per square inch at 2192° F |
|---|---|---|
| I | 11 | 8.40 |
| II | 5 | 5.88 |
| III | 5 | 7.81 |
| IV | 17 | 7.70 |
| V | 7 | 7.11 |
| VI | 16 | 5.95 |
| VII | 24 | 7.00 |
| VIII | 6 | 8.93 |

The face samples of coal from this district when ground to 200-mesh size, air-dried, and tested in the explosibility apparatus at the Urbana laboratory show less explosibility than the coal of any other district, although the rib dust of some other districts is less explosible on account of an admixture of fine shale dust. In Table 3 are compared pressures developed in the explosibility apparatus for the various districts in Illinois.

## SYSTEM OF MINING

Although the coal bed in this district has a thin cover all mines are opened by shafts. There are no drifts, slopes or strippings. Seven of the eight mines are worked according to the double entry room-and-pillar system; the panel system with triple main entries, maintaining one of the air-courses for a traveling way, is used in the other mine.

The variable shale parting in the bed gives rise to two sets of conditions. Where the parting is less than 4 inches thick the two benches of the bed are worked as one and the working faces in rooms and entries are 6 to 7 feet high in places. Where the parting is over 4 inches thick the lower bed only is mined and the parting becomes the mine roof. The lower bench averages $3\frac{3}{4}$ feet.

Where both benches are worked and the bed is over 6 feet thick only the lower 6 feet of coal is mined, 8 to 12 inches of top coal being

left. The shale roof disintegrates on exposure to the air, but top coal is not affected by temperature and remains intact for many years. Where it is possible to leave top coal in entries the roof is arched, as shown in fig. 2. In driving entries the lower 3 feet of

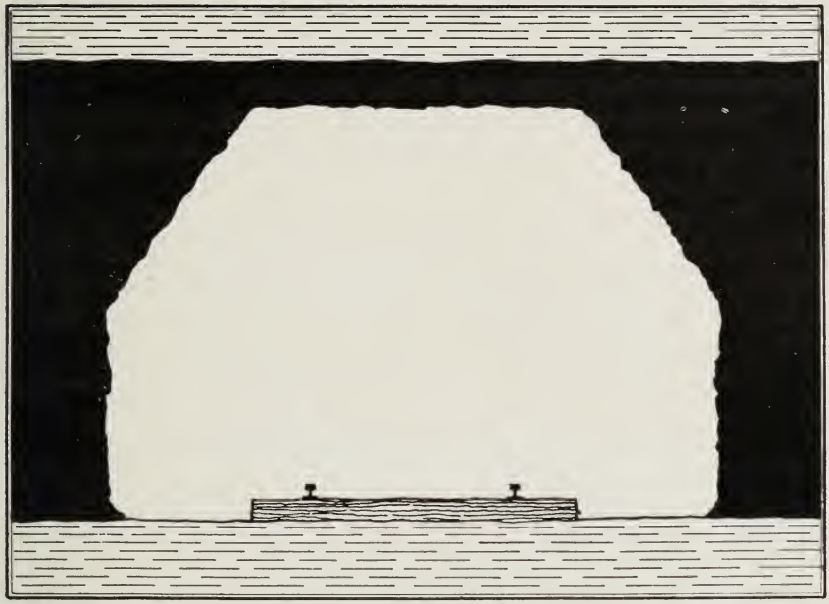

FIG. 2. Arching of Top Coal in Entries.

coal is drilled and shot off the solid; but all arching in the upper 3 feet is hand sheared, with the result that the top coal remains permanently in place and requires no support except where fractured by slips. Top coal is arched in several districts in Illinois, but usually the arch is roughly formed by shooting, and the top coal is often fractured by the shots.

Where the two benches of the bed are united but the coal is not over 6 feet thick the full thickness of the bed is mined, and the gray shale overlying the coal becomes the roof. In rooms 2 to 4 inches of this shale are drawn or come down with the coal. Where the lower bench only is worked, by the terms of the Illinois State Agreement between the Illinois Coal Operators' Association and the United Mine Workers of America the miner brushes 14 inches of roof over roadways in rooms. The width of brushing varies from 5 to 8 feet. The gob obtained is laid along both sides of the track.

Only one of the mines examined operates with any regular dimensions of rooms and pillars. At all of the others pillar-gouging is permitted. In one mine the coal of the main barrier pillar was

taken out, leaving an insufficient pillar to protect the main entry.

The main and cross entries vary in width from 8 to 9 feet. In the one mine operating on the panel system the width of room entry is 9 feet; 16 rooms being turned off each entry. No attempt is made to draw pillars except in the panel system mine and there when two adjacent rooms are driven up, the room pillar is drawn, where it has not been gouged, by taking a 6-foot slice off each rib. It is said that one-half of the pillar coal is thus recovered.

The cleat in the bed is well marked, but in the panel mine alone is advantage taken of the cleavage to drive entries on the butt of the cleat, and rooms on the face.

Numerous horses of micaceous sandstone and small faults cause difficulty in mining and add considerably to the cost of coal production. In places these horses are of great length, one of them extending throughout a mine. In driving through these, blasting with dynamite is done off the solid.

Table 4 gives dimensions of workings at each mine examined.

TABLE 4.—*Dimensions of workings in feet*

| No. | Depth of shaft | System of mining | Entry width | | Entry pillar width | | Main barrier pillar width | Room | | Width of room pillar | Room-neck | | | Distance from entry to full room width | Width of cross-cut | Percent of coal gained |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Main | Cross | Main | Cross | | Width | Length | | Width | Length | Method of widening | | | |
| 12 | 125 | Room-and-pillar | 8 | 8 | 12 | 12 | 20 | 24 | 150 | 18 | 8 | 10 | 45° to right and left | 20 | 8 | 44 |
| 13 | 114 | Panel | 9 | 9 | 20 | 20 | 30 | 24 | 250 | 20 | 9 | 4 | 45° to left | 20 | 9 | 55 |
| 14 | 135 | Room-and-pillar | 8 | 8 | 18 | 18 | ... | 28 | 250 | 22 | 8 | 12 | 45° to left | 22 | 8 | 46 |
| 15 | 160 | Room-and-pillar | 8 | 8 | 18 | 18 | 20 | 25 | 240 | 17 | 8 | 10 | 45° to right and left | 20 | 10 | 49 |

To obtain full room width in two mines room necks are widened at an angle of 45 degrees to the left only; in the others the widening is done at 45 degrees both to the right and left. Where the roof falls under quicksand deposits, sand and water are admitted. In one mine approximately 1,000,000 gallons per 24 hours flow into the mine through caves. This water is pumped out through drill holes by two automatically-started electric turbine pumps of 250 gallons per minute capacity; two stationary electric pumps of 180 gallons per minute capacity; and five portable electric pumps discharging 70 gallons per minute. Water flows into some mines through channels in the floor under the coal. The caves under quicksand deposits

often bring about surface subsidence, one of 18 feet having been reported.

The laborers in the district are principally of three nationalities: American, Italian and Negro, the majority being Americans. Although nearly all the coal produced is undercut, the per capita production of all classes of employees in the district is low as compared with that in all other districts of the State combined. (Table 5.)

TABLE 5.—*Per capita production of coal*

| Mine No. | 12 | 13 | 14 | 15 | District[a] | All other districts combined[a] |
|---|---|---|---|---|---|---|
| Average daily tonnage | 150 | 1300 | 300 | 800 | 3206 | 356,258 |
| Number employees | 54 | 255 | 93 | 196 | 750 | 78,661 |
| Surface employees | 4 | 50 | 13 | 26 | 97 | 6,952 |
| Underground employees | 50 | 205 | 80 | 170 | 653 | 71,709 |
| Face workers (miners, loaders and machine men) | 37 | 152 | 56 | 130 | 441 | 52,877 |
| Underground employees per each surface employee | 12.5 | 4.1 | 6.2 | 6.53 | 6.7 | 10.3 |
| Tons of coal a day per employee | 2.8 | 5.1 | 3.2 | 4.1 | 4.3 | 4.6 |
| Tons of coal a day per surface employee | 37.5 | 26.0 | 23.1 | 30.8 | 33.0 | 51.3 |
| Tons of coal a day per underground employee | 3.0 | 6.3 | 3.8 | 4.7 | 4.9 | 5.0 |
| Tons of coal a day per face worker[b] | 4.1 | 8.5 | 5.4 | 6.2 | 7.3 | 6.8 |

a. For the year ended June 30, 1912.
b. Shipping mines only.

The district has been fortunate in having but few fatal accidents, but the number of non-fatal accidents is greater than is warranted by the coal output. The sum, however, of both fatal and non-fatal accidents is consistent with this output, which for the year ended June 30, 1912, was 0.9 per cent that of the State. In this year 0.8 per cent of the combined fatal and non-fatal accidents in the State occurred in District II.

## VENTILATION

The ventilation of the mines in this district presents no difficult problems, and the ventilating equipment is suitable to their capacity. (Table 6.)

The largest quantity of air delivered by the ventilating fan at any mine examined was 50,000 cubic feet a minute; a greater quantity is unnecessary because gas is not present in large quantities, and also because comparatively few men are employed in the present workings. Two of the mines examined had blowing fans, and two

exhaust. Sling psychrometer readings in rooms for October, 1913, showed a relative humidity of mine air varying from 90 to 100 per cent. The return air at one mine had 100 per cent relative humidity, as shown by hygrometer readings reported daily by the mine officials from February 11, 1912, to February 16, 1913.

TABLE 6.—*Ventilating equipment*

| No. | Depth of air-shaft | Size in feet of air-shaft in clear | Type of fan | Diameter of fan in feet | Width of blade in feet |
|---|---|---|---|---|---|
| 12 | 125 | 8 by 10 | Paddle wheel[1] | 16 | 4 |
| 13 | 114 | 9 by 20 | Robinson | 10 | 3 |
| 14 | 135 | 4½ by 7½ | Paddle wheel | 16 | 4 |
| 15 | 160 | 8 by 12 | Robinson | 6 | 2½ |

1. Paddle wheel refers to straight blade type of fan; often home made.

No underground fires of consequence have occurred in the district. Seepage water makes unnecessary the sprinkling of roadways. The underground fire liability is further decreased by the stabling of mules on the surface.

In mine 9 of the Big Muddy Coal and Iron Company danger of underground fire is reduced to a minimum by prohibiting the storing of oil in the run-around. The daily supply taken below is stored in a small room driven in the rib near the shaft and closed by a fireproofed door. The oil is also heated here by steam coils. This mine has one intake haulage entry and two return air-courses; is operated on the panel system: and is one of the two mines of the district in which have been placed concrete stoppings on the permanent entries. These stoppings are built with concrete blocks 5 inches thick, having an exposed surface 8 by 20 inches. The blocks—made on the surface with 1 part cement and 6 parts cinders—cost 6 cents each delivered at the pit mouth.

Stoppings of untamped gob in two of the mines examined gave low ventilating efficiency because of the large amount of air short-circuiting through leaks.

Although the dust of the district is not highly explosive the dangerous practice, observed in one mine, of leaving machine cuttings at the face while shots are being fired should be prohibited.

At one mine a brick-lined air-shaft has recently been sunk. The air-shafts at all other mines are timber lined.

## BLASTING

In District II a greater proportion of the coal mined is undercut by machines than in any other district of the State. During the

year ended June 30, 1912, the district produced 500,102 tons of coal of which amount 479,779 tons, 95.9 per cent of the total production, were mined by machines. Every mine in the district except two local mines has undercutting machines installed.

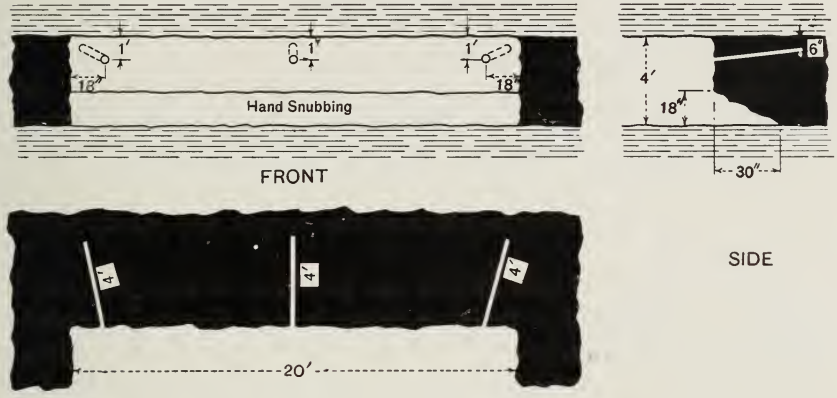


FIG. 3. Method of Shooting After Hand Snubbing

At three of the four mines examined puncher machines operated by compressed air are used; in the other mine the coal is undercut with electric chain machines. The usual method of supplying air to

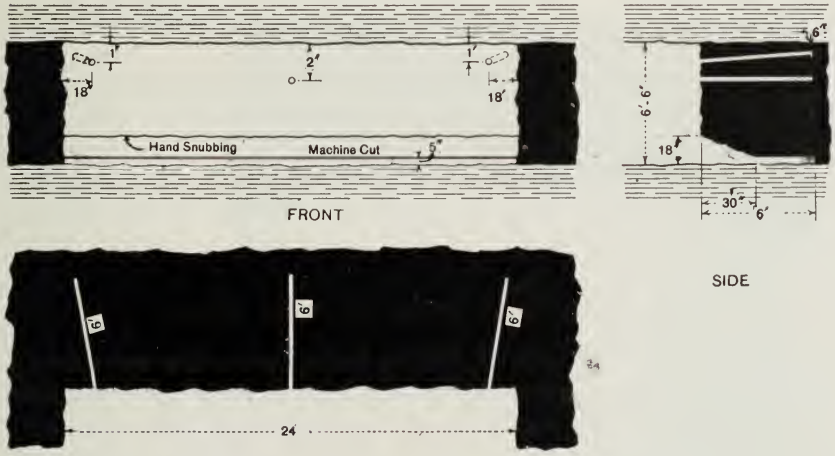


FIG. 4. Method of Shooting After Chain Machine

the puncher machines is to carry it from the compressor down the shaft and through the main entry in a 4-inch pipe, reducing to a

2-inch in the cross entries and to $1\frac{1}{4}$ inches from the cross entries to the faces of rooms.

The large percentage of undercut coal accounts for the use of a comparatively small amount of powder. During the year ended June 30, 1912, the district while producing 0.9 per cent of the output of the State used 4,566 kegs of powder for blasting coal, only 0.3 per cent of the total for the State.

Size FF black powder is used exclusively in blasting coal. The use of this small grained powder results in a low percentage of lump coal. At the mines examined the per cent of coal over $1\frac{1}{4}$ inches varies from 50 to 70. The number of tons of coal gained per keg of powder varies from 100 to 150 and the output per machine from 35 to 150 tons.

In the mines of this district the provision of the State law in regard to material for tamping holes is not observed carefully; machine cuttings in dummies are often used. In general the length of holes drilled is consistent with the depth of undercutting and the thickness of the bed.

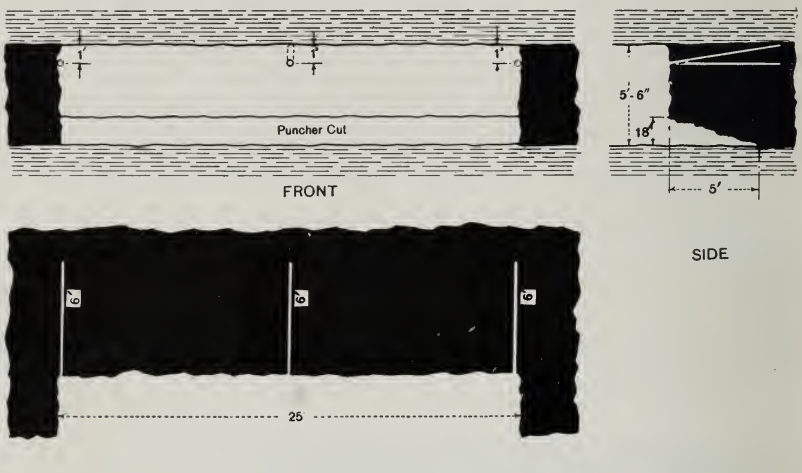


Fig. 5. Method of Shooting After Puncher Machine

The general methods of placing holes in the face are shown in Figs. 3, 4 and 5. Three holes constitute a round at every mine examined. The only variation of method is in the distance below the roof at which the center hole is drilled.

Roof brushing, which is done with black powder, is easily accomplished, one hole about 2 feet long bringing down $4\frac{1}{2}$ linear feet of roof.

Table 7 gives blasting data for each mine examined. All of the

figures for the percentages of lump coal over 1¼ inches were obtained from the books of the companies.

TABLE 7.—*Blasting*

| No. | Kind of machine | Depth of cut in feet | Tons a day per machine | Length of holes in feet | Tons of coal per keg of powder | Powder cost in cents per ton of coal | Per cent of lump over 1¼ inches |
|---|---|---|---|---|---|---|---|
| 12 | Compressed air puncher | 4 | 35 | 4 | 100 | 1.8 | 70 |
| 13 | Electric chain | 6½ | 150 | 6 | 115 | 1.7 | 50 |
| 14 | Compressed air puncher | 5 | ..... | 4¾ | 150 | 1.2 | See foot note[a] |
| 15 | Compressed air puncher | 4½ | ..... | 5½ | 125 | 1.4 | 60 |

a. 55 over 1½ inches

## TIMBERING

Where the two benches of the bed are united and the coal is over 6 feet thick, top coal is left up in entries and the roof is arched. (Fig. 2.) No timber is used in entries under top coal except where it is broken by slips.

When the lower bench only is mined the roof is supported by three-piece timber sets having 8-inch crossbars and 6-inch legs. White oak is generally used for entry timbering. In a few instances the legs of the timber set are placed in hitches cut in the rib. (Fig. 6.) In one mine 80-pound steel crossbars with T section are used on white oak legs under bad roof on the main haulage entry and white oak crossbars in all other entries.

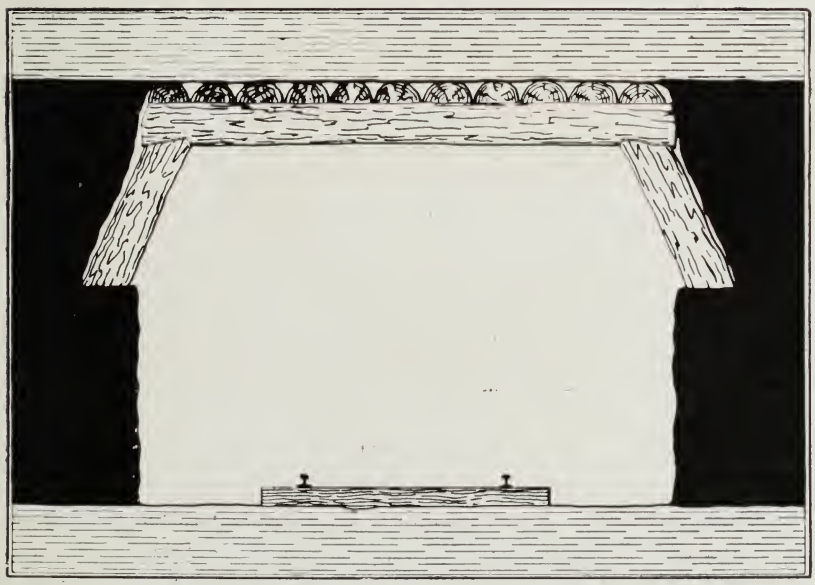

FIG. 6. Timbering in Entries Under Shale Roof

The roof in rooms not working under top coal is difficult to support. Roadways to the face are provided by brushing the roof in low coal and throwing the gob alongside the track. Propping expense is heavy; the number of props per 100 square feet of roof varying from 4.8 to 7.5 is greater than in any other district in Illinois. (See Table 8.) These figures were obtained by counting the number of props in 100 linear feet of typical rooms the widths of which had been measured. Room propping is carefully done in the district, especially in one mine, where systematic propping is enforced. At this mine, where pillars are drawn by cutting a slab 6 feet wide from each rib, two extra rows of props are set between the track and the right-hand rib to support the roof as the pillar is drawn.

The operators of the district often are able to get 30 per cent of white oak timber in each shipment of props. Both split and round props with a diameter of 4½ inches at the small tip are used at each mine examined. Their length varies from 4 feet under low coal to 7 feet when both benches of the bed are united.

The total timbering cost, including room propping and entry timbering, varies from 5 to 8 cents per ton of coal mined.

All shafts in the district except one—which has a brick lining—have timber linings, as they were sunk before the passage of the State law requiring new shafts to be fireproofed.

TABLE 8.—*Timbering*

| No. | Total timber cost in cents per ton of coal. | Room Props | | | | |
|---|---|---|---|---|---|---|
| | | No. per 100 square feet of roof | Cost in cents per 100 square feet of roof. | Lenghth in feet. | Life in months | Per cent of white oak. |
| 12 | 8 | 6.6 | 26.4 | 4 | 18 | 33 |
| 13 | ..... | 4.8 | 33.6 | 7 | 18 | 15 |
| 14 | ..... | 7.5 | 33.8 | 4½ | 18 | 25 |
| 15 | ..... | 5.5 | 38.5 | 7 | 24 | 30 |

## HAULAGE

Conditions in the district are not favorable to low haulage costs. Two of the mines examined had modern equipment, but in only one was sufficient attention paid to easing curves and maintaining

uniform grades. In general throughout the district haulage entries are too narrow for safety, and are not kept free from gob.

Pit cars are hauled from partings to the bottom by main-and-tail rope in one mine, by standard electric locomotives in one, by a rack-rail electric locomotive in one, and by mules in five. Hauling from face to partings at all mines is done by mules. They are kept in good condition. The rails are light, varying from 16 to 30 pounds on the main haulage and from 12 to 16 on the cross entries and in rooms. Track gages vary from 30 to 42 inches.

TABLE 9.—*Haulage*

| No. | Kind of haulage in main entry | No. locomotives | Track gage in inches | Rail weight in pounds per yard | | Pit Cars | | Ratio of coal to car weight | Per cent of car weight in total load. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Main haulage | Secondary haulage | Weight in pounds | Capacity in pounds | | |
| 12 | Mule | .... | 36 | 16 | 16 | 1200 | 1800 | 1.5 | 40.0 |
| 13 | Electric locomotive | 2 | 42 | 30 | 16 | 2400 | 4300 | 1.8 | 35.8 |
| 14 | Mule | .... | 32 | 16 | 12 | 1100 | 2600 | 2.4 | 29.7 |
| 15 | Electric rack-rail locomotive | 2 | 30 | 30 | 16 | 2200 | 3000 | 1.4 | 42.3 |

Those mines working in the lower bench where narrow and low entries are necessary have light pit cars of small capacity; at only one mine in the district do the pit cars each hold two tons. The average weight of these cars at the mines examined is 1,725 pounds; the average capacity, 2,925 pounds. Hence, an average of 37.1 per cent of the weight hauled from face to shaft is car weight. An excess weight of car is carried in transporting the coal in the mine. With a car lighter and of greater capacity, haulage expense could be lessened.

No figures for ton-mileage of locomotives could be obtained.

Table 9 gives haulage data for each mine examined.

## HOISTING

No mine in the district has a sufficiently large daily production or is of such depth as to necessitate great hoisting speed, so that the hoisting equipment has no unusual features of size or arrangement. First motion hoisting engines are in use at all mines examined. Cylindrical and conical drums are each used at two mines.

TABLE 10.—*Hoisting*

| No. | Average daily tonnage | Self-dumping cage? | Depth in feet | Size in feet | Automatic caging | Hoisting engine—Size of cylinder in inches | Drum | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Type | Diameter in feet [1] | Length in feet |
| 12 | 150 | Yes | 125 | 6 by 14 | No | 12 by 16 | Cylindrical | 4½ | 8 |
| 13 | 1300 | Yes | 114 | 9 by 20 | Yes | 18 by 36 | Conical | 7 | 5 |
| 14 | 300 | No | 135 | 7 by 12 | No | 18 by 36 | Cylindrical | 4¾ | 8 |
| 15 | 800 | Yes | 160 | 7 by 16 | No | 16 by 32 | Conical | 6 | 6 |

1. Largest diameter if conical.

Caging at the bottom is done automatically at one mine and by hand at three, although in only one is there a platform cage from which the cars are pushed by hand at the tipple.

Table 10 gives hoisting data for each mine examined.

# PREPARATION OF COAL

The sizes of coal made in this district, which differ at each mine examined, are shown in Table 11. Tipple equipment is given in Table 12.

TABLE 11.—*Sizes of coal made*

| No. | Name | Size |
|---|---|---|
| 12 | Lump | Over 2¼ inches |
| | Screenings | Under 2¼ inches. |
| 13 | Six-inch lump | Over 6 inches. |
| | Six-inch egg | Over 4 inches and under 6 inches. |
| | One-and-one-half inch lump | Over 1½ inches and under 4 inches. |
| | Nut | Over 1⅛ inches and under 1½ inches. |
| | Screenings | Under 1⅛ inches. |
| 14 | Six-inch lump | Over 6 inches. |
| | One-and-one-half inch lump | Over 1½ inches. |
| | Nut | Over ¾ inch and under 1½ inches. |
| 15 | Six-inch lump | Over 6 inches. |
| | Six-inch egg | Over 3 inches and under 6 inches. |
| | Small egg | Over 2 inches and under 3 inches. |
| | No. 1 Nut | Over 1¼ inches and under 2 inches |
| | No. 3 Nut | Over ¼ inch and under 1¼ inches. |
| | No. 5 Nut | Under ¼ inch. |

At each mine examined shaking screens are used, with lengths varying from 16 to 42 feet, and with widths of 6 to 8 feet. They have an inclination of either 3 or 4 inches a foot, and make from 60 to 100 shakes a minute.

At the one mine where a further separation is made after passing the coal over a shaker-screen a washery of the Stewart type is installed. A description of this washery is contained in Bulletin 69, Coal Washing in Illinois, published by the Engineering Experiment Station of the University of Illinois.

TABLE 12.—*Tipple equipment*

| No. | Sizing screen | | | | Is coal rescreened or washed | Per cent of lump over 1¼ inches |
|---|---|---|---|---|---|---|
| | Length in feet | Width in feet | Inclination (inches per foot) | Shakes per minute | | |
| 12 | 32 | 6 | 3 | 90 | Neither | 70 |
| 13 | 40 | 8 | 4 | 84 | Neither | 50 |
| 14 | 16 | 6 | 4 | 60 | Neither | See foot note[a] |
| 15 | 42 | 6 | 3 | 100 | Washed[b] | 60 |

a. 55 over 1½ inches.
b. Stewart type washery.

There are no steel tipples in the district.

The power plants do not develop large horse-powers and are of ordinary construction and equipment. All of the boilers are fire-tube at the mines examined. Table 13 gives power-plant data for each mine.

TABLE 13.—*Power Plant Equipment*

| No. | Boilers | | | Electric Generators | |
|---|---|---|---|---|---|
| | No. | Total H. P. | Average steam pressure | K.W. | Voltage |
| 12 | 2 | 300 | 100 | ..... | ..... |
| 13 | 6 | 900 | 125 | 225 | 250 |
| 14 | 9 | 450 | 80 | ..... | ..... |
| 15 | 8 | 200 | 120 | 125 | 250 |

## PUBLICATIONS OF THE ILLINOIS COAL MINING INVESTIGATIONS

Bulletin 1. Preliminary Report on Organization and Method of Investigations, 1913.

Bulletin 2. Coal Mining Practice in District VIII (Danville), by S. O. Andros, 1914.

Bulletin 3. A Chemical Study of Illinois Coals, by Prof. S. W. Parr, 1914.

Bulletin 4. Coal Mining Practice in District VII (Mines in bed 6 in Bond, Clinton, Christian, Macoupin, Madison, Marion, Montgomery, Moultrie, Perry, Randolph, St. Clair, Sangamon, Shelby and Washington counties), by S. O. Andros, 1914.

Bulletin 5. Coal Mining Practice in District I (Longwall), by S. O. Andros, 1914.

Bulletin 6. Coal Mining Practice in District V (Mines in bed 5 in Saline and Gallatin counties), by S. O. Andros, 1914.

Bulletin 7. Coal Mining Practice in District II (Mines in bed 2 in Jackson county), by S. O. Andros, 1914.