The fan and engine have proved very satisfactory to the management. The air at the present time in this mine is good. The fan house is of concrete, making it fireproof. There has been added forty new pit cars, and new coal bins have been constructed.

The Stonington Coal Company has also made improvements. The management put in a new Sirocco fan, about the same size as the Christian County Coal Company's, with a Ridgway engine, which gives plenty of air for the mine and has proved satisfactory to the management; also installed one Tubular Brownell boiler, a new generator, about forty pit cars and a new Goodman motor. There have been some needed improvements below ground.

Taking it all in all we feel, that, while the improvements in Christian County may not have been so marked as in some other counties, they have been along a line much needed and will be permanent.

IMPROVEMENTS AT BUNSEN COAL COMPANY'S MINES DURING YEAR ENDING JUNE 30, 1912.

KELLEY NO. 2.

Installation of 12 chain mining machines completed.
Work of installing 1 150 H. P. Tubular boiler and 100,000 cu. ft. capacity ventilating fan with engin begun.
Eighty wood mine cars purchased.
Shaker screens were replaced with set of gravity screens.
Engine house remodeled.
An outside rock hoist and trestle built.

KELLEY NO. 3.

Installation of 9 chain mining machines, begun in 1911, completed this year.
Fifty wood mine cars purchased.
Outside rock hoist and trestle put up.
Installation begun of 1 72 in. x 18 in. Tubular boiler.

KELLEY NO. 4.

Shaft bottom extended.
Cage room retimbered.
Fireproof pump room built.
Work begun on installation of 1 72 in. x 18 in. Tubular boiler.
One 75 K. W. generator with engine, and extension to boiler house.
Gravity screens put in to replace shaker screens formerly used.
One hundred wood mine cars bought.
Large amount of haulage extension and improvement.
One outside rock hoist and trestle built.
One 60-gallon double chemical fire engine purchased.

VERMILION.

Completed installation of 17 chain mining machines.
Put down a 9 in. x 14 in. concrete escapement and air shaft.
Installed two self-dumping Olsen cages.
Changed screens from shaker to gravity type.
Built outside rock hoist and trestle.
Built concrete powder house.
Purchased one 60-gallon double chemical fire engine.

FIREPROOF ESCAPEMENT SHAFT AND UPCAST AIRWAY AT THE VERMILION MINE OF THE BUNSEN COAL CO., NEAR WESTVILLE.

The Bunsen Coal Co., of Westville, Ill., a subsidiary of the United States Steel Corporation, broke ground on Oct. 5, 1911, for the construction of a concrete lined shaft combining an escapeway for the men and an upcast airway for ventilating purposes. The Vermilion mine has a daily output of 2,750 tons. The development at the present time comprises about 500 acres of the Grape Creek coal seam. The point chosen for the shaft location is 3,500 feet from the hoisting shaft. Departing from the ordinary procedure of contracting the work and in order to obtain the experience during construction, the company purchased all equipment necessary and completed the work with their own force. Work was stopped during the winter months and started again in April, 1912. The shaft lining walls being completed on June 1. The method of sinking and design adopted combine the new features of a rectangular shaft of concrete and the sinking of same through the soft stratas by means of a steel shoe and the weight of the concrete lining walls.

DESCRIPTION OF SHAFT.

The shaft is of rectangular design and measures 8 feet in width by 13 feet in length in the clear between the concrete lining walls. The concrete walls have a thickness of 21 inches from the top of coping to steel shoe, a distance of 52 feet. From this point to the bottom of shaft the walls have an average thickness of 12 inches. The total depth of shaft is 205 feet to the archway landings at the bottom. A sump with a depth of 3 feet and 6 inches is provided. The shaft has an opening area of 104 square feet. The steel stairway and landings occupy a width of 4 feet and 10 inches and extends the length of the shaft. The pattern is of open design and only a small percentage of the space taken up would effect the ventilation and upcast which goes through the stairway.

Two reenforced concrete archways are provided at the shaft bottom, one for the upcast air from the mine and the other from entrance to the stairway. Each arch has a span of 7 feet and a height of 9 feet from landing to the top of crown, both arches extend a distance of 6 feet from the shaft lining. The sump is floored over and supported on 3-inch I-beams.

The steel shoe for the sinking of shaft, from the surface of ground to the solid strata, is of rectangular design, forming an open caisson, and measured when set up ready for sinking 11 feet 6 inches by 16 feet 6 inches. The side and end plates are one-half inch thick.

The shoe before riveting together comprised six sections and were connected up with ½ inch by 12 inch by 26 inch splice plates thoroughly riveted. The rivet heads were all countersunk on the back of shoe to lessen the friction when sinking. The four rectangular corners were all stiffened with the same size plates. The shoe has a vertical depth on the back line of the lining of 26 inches, and run on an angle of 45 degrees from the cutting edge to the inner side of the lining at top of shoe. The two side pieces between splice connections are each 10 feet long and the four corner sections measure each 5 feet 9 inches on the end and 3 feet 3 inches on the side. The opening at top of shoe provides for a concrete lining wall 15 inches thick. The side and end plates at the top between the splice connections are all stiffened with 3 inch by 3 inch by ½ inch angles. To prevent the top from buckling or spreading, 1 inch by 15 inch bolts are placed every 3 feet around the entire shoe, and have countersunk heads on the back. Between the horizontal bolts and extending around the entire shoe and spaced 3 feet apart, 1 inch diameter by 6 feet in length vertical rods were used to tie in the shoe to the first section of concrete lining, the top of these rods were bent in U form to receive similar rods which were placed as each section of lining wall was poured and extended to the top of coping. The shoe when completed had a total weight of 7,000 pounds.

Wooden forms were used for all of the concrete lining work and were made up of 2 inch by 10 inch surfaced plank carefully put together and stiffened vertically with 4 inch by 6 inch strips. The forms were 6 feet high, two side and two end pieces formed the units for the entire section. An inside and outside form was necessary for the placing of the concrete until the shoe was landed on solid strata. These forms remained in position at the top of the shaft until this portion of the work was completed. To readily release the concrete when set and remove the forms when necessary, all of the connecting joints had beveled edges and were brought into position by wedging. The sides and ends were well braced to hold in the correct position.

From the shoe to the shaft bottom an inside form only was necessary, the concrete filling into the sides of the rock excavation or against the 2-inch curbing timbers. No forms were removed from the concrete until it had set for at least two days.

The steel stairway is of zig-zag pattern and together with the landings occupy a space longitudinally in the shaft for a width of 4 feet 10 inches. Each flight rises on a 38° angle from the vertical, and is 11 feet long. The separate flights including the landings are supported on 8 inch channels weighing 11¼ pounds per foot; placed crosswise in the shaft and are secured in the concrete side walls by placing in pockets and grouting the ends which have a bearing of 6 inches in the wall. These channels are placed 2 feet from the end walls and are spaced vertically 6 feet apart, alternating for each flight.

The stair stringers are ¼ inch by 7 inches deep. The treads are ¼ inch by 11 inches by 27 inches with checkered surfaces and are supported on 1½ inch by ¼ inch angles riveted to the stringers. The rise between treads is 8 inches. The landing plates are 4 inches by 25 inches by 58 inches and are also checkered on the surface. Three lugs of 3½ inch by 5 inch by ⅜ inch angle iron are riveted to the plate and fastened to the concrete wall by means of ⅝ inch by 5 inch expansion bolts well drawn up. The hand railing is made up of two lines of 1½ inch pipe, the uprights are bolted to the stair stringers and connected to each line of railing. The total weight per vertical foot of stairway and landings, not including the channel supports, is 95 lbs.

Before placing any steel work two coats of paint was applied on the surface and another coat in the shaft upon completion of the work.

The cutting of the pocket holes in the concrete and the drilling of same for the bolt holes was all done by hand. The men erecting temporary scaffolds as each flight was placed, working from the bottom upwards. This stairway is very easy for the men to walk on and is of economical design, making the shaft absolutely fireproof.

For sinking work, the use of a steel shoe to penetrate the soft stratas was used and carried the concrete caisson from the surface of ground to a point 52 feet below the top of coping.

To give the shoe a good start excavation was first made giving ample clearance for a depth of 3 feet when the forms were placed in position at the surface and the first section of concrete lining wall poured to a depth of 6 feet.

Mucking was then started and as the sides of the excavation were cleared the weight of the concrete started the cutting edge and penetration of the shoe, until sufficient depth was made for the placing of another 6 foot section of concrete wall. This same process was repeated until shoe and concrete walls were landed on the solid strata at a depth of 52 feet from top of coping. For this depth the walls were 21 inches thick and the entire section sunk by the weight of the concrete through the surface soil, sand, gravel and clay stratas. To tie together each vertical 6 foot section of concrete lining wall 1 inch diameter by 6 foot rods were placed around the entire section and spaced 3 feet apart. The concrete mix was composed of one part "Universal Portland cement," 2 parts sand and 5 parts gravel. For the closing in sections an extra bag of cement was added to each batch. The concrete was mixed in a cubical mixer located near the top of shaft, poured into buckets, lowered and the mix distributed in the several forms by means of a movable chute supported on a temporary platform at the top of each section in the shaft. No supporting buntons for the side walls were used in this shaft.

From shoe to the shaft bottom the usual method of sinking was employed, namely, drilling and shooting the sump holes and benches, carrying down the excavation as far as possible to permit the placing of from 20 to 60 feet of concrete lining wall, when the sinking and concreting process was repeated.

When soft stratas and fire clay seams were encountered in the excavation, 2 inch by 10 inch curbing timbers were placed to protect the sides from caving and protection to the men.

When the shoe was landed, several cracks appeared in the concrete walls mainly due to the pressure exerted by the weight of the concrete not settling evenly, at times one end was much higher than the other, when mucking at the lower end had to be stopped and continued at the high end until both came to the same level. When shoe was landed the shaft section for a depth of 52 feet was found to be about 9 inches out of plumb, this was equalized and the cracks grouted by placing a concrete veneer over the entire top section; the concrete was adhered to the original walls by the use of ¾ inch lag screws staggered every 3 feet and firmly placed in the original concrete, making a good appearing and efficient job when the work was completed. The advantage of sinking by this method, through soft ground, over that of using curbing timber and jacking the shoe down by hand, was not only in progress, but also the saving in cost by eliminating any heavy timber that might be necessary, and pouring the concrete for the heavier wall sections and erecting the forms on the surface. Very little water was met with during the work and little trouble was experienced taking care of it. During the sinking and concreting work two 8-hour shifts were employed consisting of seven men on each shift. One shift only was used of five men when the stairway was erected.

The equipment consisted of a straight mast derrick with swinging gear attachment and a 50-foot boom handling all of the muck and conveying the concrete. One double drum hoisting engine size of cylinders 6½ inch by 10 inch; attached to the engine was a 20 H. P. vertical boiler; one 50 H. P. portable five-tube boiler; one duplex feed water pump, size 6 inch by 4 inch by 6 inch; two side dump trucks; two dump buckets each of one cubic yard capacity and one cubical concrete mixer with engine attached was used. The mixer had ½ cubic yard capacity. Electric lights for the work were furnished from the Vermilion mine generator and water for boiler use was pumped from the same place.

Mine Fires.

About the 7th of August, 1911, a fire was discovered in the abandoned works of the Christian County Coal Company's mine. The old works where the fire originated had been mined by machines and was caused by spontaneous combustion.

The fire was so far away from the works that it could not be controlled, it being impossible to get to the fire with sufficient water to put it out.

The mine rescue car spent two or three days at the mine, but conditions were such that the thought of putting out the fire with water was abandoned. The closest place of the fire to the workings of the mine is 600 feet.

The fire is walled in with forty-eight brick and concrete stoppings and up to the present time there has been no indication that the fire is still burning.

Fatal Accidents.

The past year shows a decrease in the number of fatal accidents and an increase of a third of a million tons of coal and I claim this is due to the system of management that some of the mines have adopted in Vermilion County.