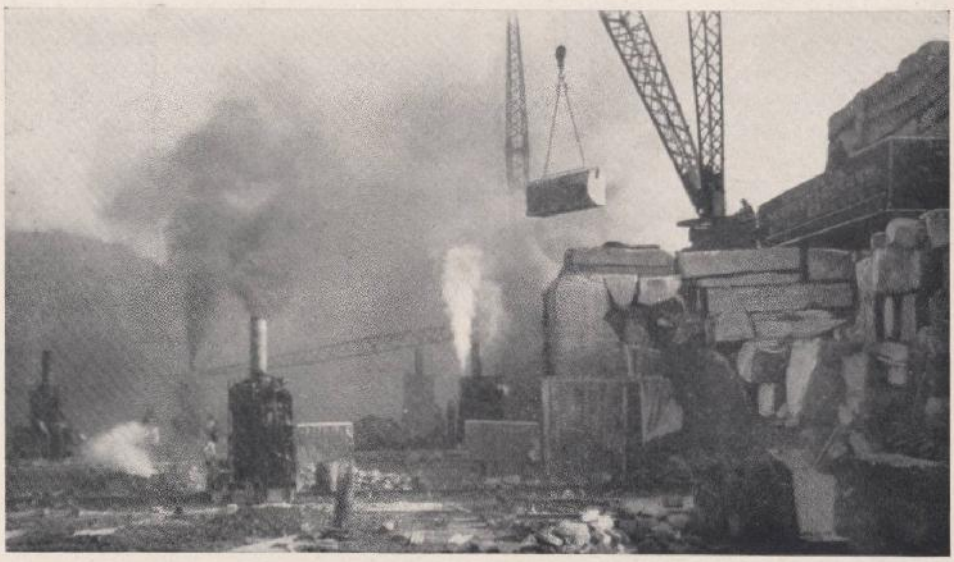
A NEW "DUPLEX" CHANNELER FOR OÖLITIC LIMESTONE

By C. J. Levey *

Quarrymen in the Indiana Oölitic district watched with keen interest the work done recently in the Hoosier quarry of the Indiana Quarries Company at Oölitic, by the new Sullivan Duplex channeling machine. Those who saw this channeler and studied its performance are enthusiastic and unanimous in their opinion that it represents the most important improvement in stone cutting methods in the history of the business.



The Hoosier Quarry on a busy day; Sullivan Duplex Channeler in foreground

The types of channelers hitherto in practical service in the Indiana field have been the lever type, with a gang of steels on each side of the track and motive power supplied either by steam engine and locomotive boiler or by electric motors; the single gang, direct acting steam channelers with vertical boilers and seven-inch chopping engine cylinders; and the eight-inch Sullivan single gang steam machine. This last has been generally accepted as the most powerful and economical channeler in use.

The new channeler which was sent to the Hoosier quarry for trial in October is of the duplex pattern, which has proved its practical usefulness in marble quarries throughout the country. It has two chopping engines and two gangs of steel arranged side by side, and is operated by steam at 140 pounds' pressure from its own boiler, which is similar, except in size, to those regularly furnished on Sullivan seven-inch and eight-inch single gang channelers. The two chopping engines have cylinders eight inches in diameter instead of 6½, as in the marble machine. The machine runs on a track of 6 feet 9¼ inches gauge, so that by turning the machine half round two cuts 8½ feet apart may be put down from one track setting.

The eight-inch duplex, classified as

* Claremont, New Hampshire.

"VW-61," has a feed screw permitting a 36-inch run, so that it is necessary to change steels only every three feet of cut. The starters, however, cut only 12 or 14 inches, in order to secure stiffness in the gangs. The feed gearing is of an improved type, in which there is only one shaft across the frame besides the feed engine crank shaft, while the feed and hoist of the chopping engine are entirely independent of the track feed.

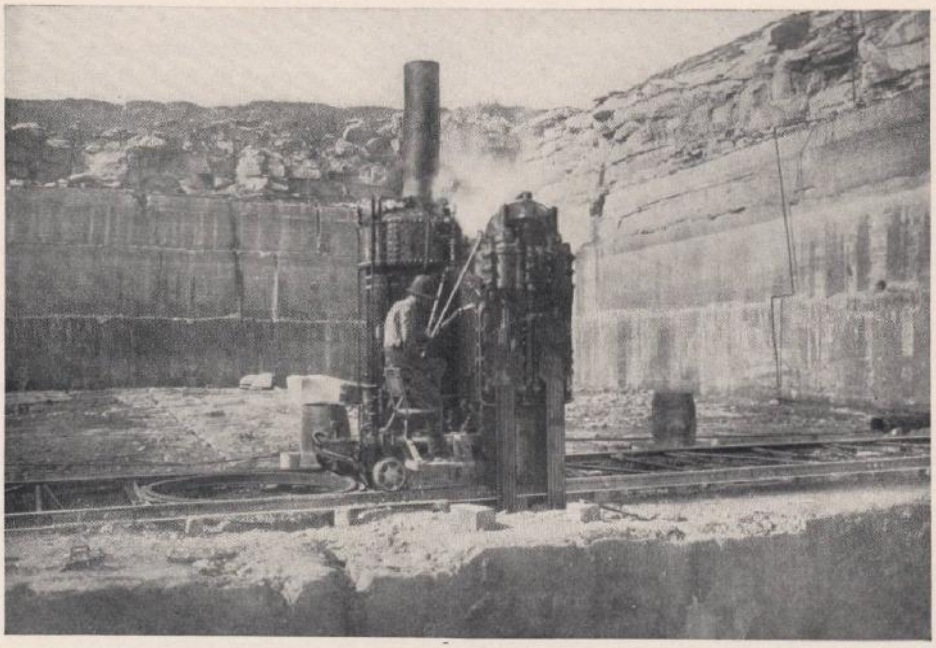
TURNTABLE

A novel feature of the equipment was the turntable section of track, shown in the photograph on page 678, at the top. At the foot of that page, the channeler is shown being swung around to cut on the other side of the track. This turntable consisted of a section of track 10 feet long, carrying between the rails, bolted and braced securely to the webs, a ring of Z section. This ring forms the lower or fixed race for what is practically a huge roller thrust bearing. The rolls consist of hardened steel discs about four inches in diameter by one inch face. The face was ground curving, to approximate the surface of a ball. To maintain even spacing of these discs, wrought iron hoops were provided. These hoops also carried small rolls on vertical axes to take the horizontal thrust. Another ring of Z section was set inside of and over the set of rolls to form the upper or moving race. To turn the demonstration machine used at the Hoosier quarry, it was merely necessary to run onto the turntable section, which was incorporated as part of the regular track; lift the machine until the wheel flanges cleared the rails, by means of four screw jacks incorporated in the frame of the machine, and set so as to bear on the movable Z ring; swing it around, and lower it to the rails in position to cut on the other side of the track. The whole operation was regularly accomplished in 15 to 18 minutes by three men, with no assistance from the derrick or other machine crews.

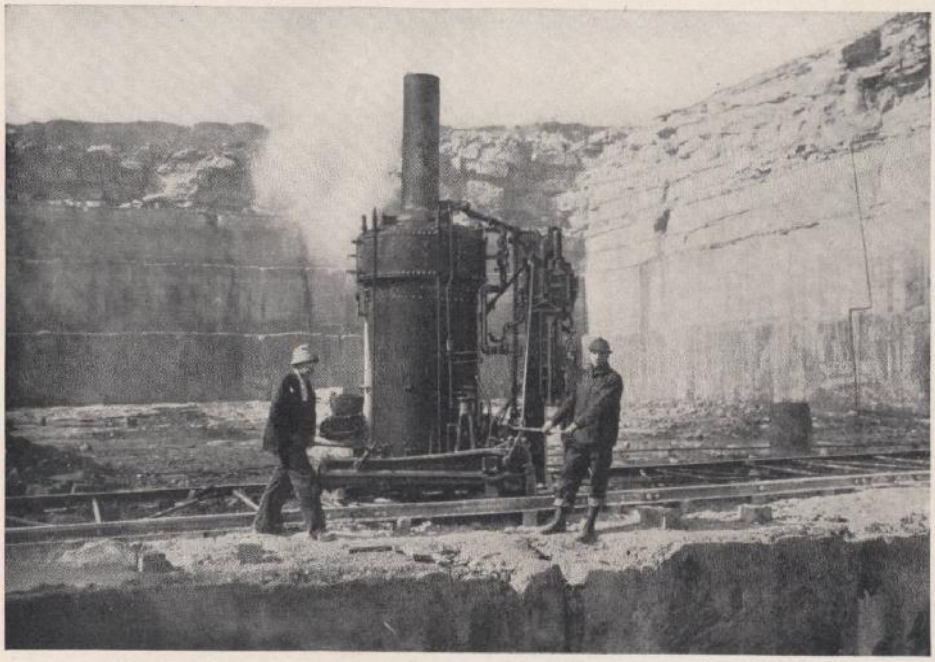
It is planned, however, to redesign the turntable, so that the part built into the regular line of track shall be composed of a plain ring, bolted and braced to the rails. Above this will be a similar ring bolted to a shorter and lighter track section, of the same gauge. A roller bearing will be placed between the rings. A center pin will carry side and end thrust. Two short pieces of rail, beveled to provide an incline, will furnish access to the turntable for the channeler. This arrangement will do away with jack-screws, and will enable the feed engine to do the work hitherto done by hand.

The valve motion and action of the duplex type of channeler were very fully described in MINE AND QUARRY for June, 1912, under the head "Vermont Marble, Chapter III." It may be well, however, to remind the reader of the peculiar advantages secured by the duplex action, which are of even more value in quarrying soft limestone than in marble. The valve motion causes the pistons to strike alternately, so that one is traveling upward while the other is striking. This action greatly reduces vibration and jar in the machine. This increased smoothness in running allows the use of less care in blocking track. It was found at Oölitic that two blocks per twelve-foot section were sufficient for the duplex, while the single head cutters required four and five blocks. Breakage due to crystallization is also practically eliminated.

In channeling "blind" cuts (those without an open end to permit the escape of sludge), the duplex has a decided advantage. Not only is the mud stirred up more than by the single chopper, thus keeping the sludge thinner, but the front gang pushes the mud ahead of it and gives the second gang a free and unrestricted blow at the rock. This action seems to have the very desirable effect of pushing the thicker mud to the top of the cut and allowing the water to get down to the point of the steels. The interesting photographs on page 680 show the action of



Sullivan Duplex "VW61" Channeler and "Turntable"



The Sullivan Duplex Channeler being swung on the turntable

the steels in the sludge, which was of the consistency of heavy mortar. As less power is absorbed in the vibration of the machine and in overcoming mud friction in the cut, more power is available for cutting stone. It should also be noted that the additional cutting head entails no more labor. The crew is three men, as on the single gang channeler. The steels also remain sharp longer than those of two single gang machines, as the wear is divided between two gangs, and is much less severe.

The new machine was operated under practical quarrying conditions at the Hoosier quarry for about six weeks, during two of which careful observations were made, with the view of obtaining data on its coal and water consumption, and determining its cutting speed. The latter, of course, would vary on different stones and under different quarrying conditions, but the data gathered are put on a comparative basis by means of observations made on three Sullivan seven-inch single channelers working on a track beside the duplex. Quarrying conditions for these machines were all as nearly identical as possible. The cuts were the same length, 114 feet long, all made between the same two head cuts, one of which was entirely blocked and the other furnishing a drain for only the first 12 to 24 inches in depth of the cut.

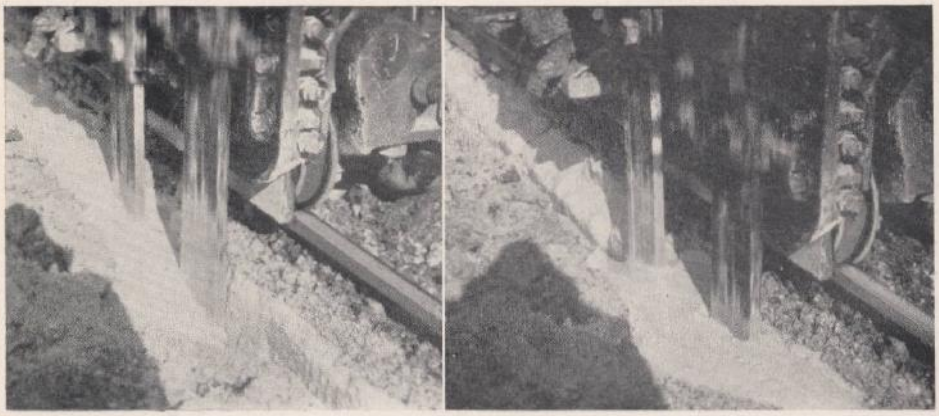
The fairest comparison of speed may be made in the feet cut per hour of running time, as this is the time during which the machines were actually striking the rock; but in order to escape any possible imputation of prejudice, we shall compare actual cutting accomplished per day and per hour, delays of every nature included.

COMPARATIVE SPEED TESTS

	Duplex "VW-61"					3-"Y7"		
Date 1912	Cut sq. ft.	Days Time, hrs.	Running Time, hrs.	Exceptional Delays Hrs.	Cause	Cut sq. ft.	Running Time, hrs.	Exceptional Delays, hrs.
Nov. 16	699	8.5	5.0	2.0	Coal...	912	6.4	0
Nov. 18	603	9.5	4.4	0.5	Coal...	570	4.3	0
Nov. 19	162	9.5	1.1	4.0	Steel..	798	6.0	0
Nov. 20	798	9.5	5.0	2.0	Coal..	1,140	7.8	0
Nov. 21	570	9.5	4.3	0.5	Steam.	798	5.9	0
Nov. 22	912	9.5	7.1	0.4	Water.	912	6.4	0
Nov. 23	513	8.5	2.9	0.0	.....	684	5.4	0
Nov. 25	741	9.5	5.9	0.0	.....	1,026	7.5	0
Nov. 26	1,026	9.5	7.4	0.0	.....	798	5.6	0
9 days	6,024	83.5	43.1	9.4		7,638	55.3	0

	"Duplex"	1 "Y7"	3 "Y7"
Average cut per day	670 sq. ft.	283 sq. ft.	848 sq. ft.
Average cut per hour	72.2 sq. ft.	30.5 sq. ft.	91.5 sq. ft.
Average cut per hour, running time	140.0 sq. ft.	46 sq. ft.	138.0 sq. ft.
Average days' time	9.27 hrs.	9.27 hrs.	9.27 hrs.
Average running time per day	4.78 hrs.	6.15 hrs.	6.15 hrs.
Average exceptional delays per day	1.04 hrs.		

The duplex was at considerable disadvantage, in that only its own crew of three men was available for moving track, while the seven-inch machines had nine men for this purpose, thus saving from two to three hours on every other move of track. It was even impossible to save any time for the duplex with its turntable device, because, as it was operating alone on its track, it was necessary to move the chopping engine standard across the frame when the machine was turned around, in order to cut into the head cuts. There were further delays, caused by shortage in coal and water, breaking in two new firemen, waiting for steel to be sharpened, and helping place other machines on the ledge. In



The thickness of mud through which the Duplex Channeler cut 1,000 square feet in ten hours is well shown by these pictures

this last, the duplex was used to shunt the seven-inch machines, placed crossways of its track, in order to place them for a head cut beyond the reach of the derrick. All these delays have been listed with their causes under the head of "Exceptional Delays," so that the reader may deduct them if desired.

It will be seen from these data that in spite of delays and handicaps suffered by the duplex machine, its average cut per day was very nearly equal to two and one half times that made by one of the seven-inch machines running beside it. Its actual cutting speed, as indicated by the average cut per hour running time, is equal to more than three times that attained by one of the single cutters.

It should be borne in mind further, in grasping the significance of this test, that the machines were running on blind cuts, and that on open end cuts, with an abundance of water to carry off the sludge, the cutting speed would be considerably higher.

The track speed of the "VW-61" channeler in this stone was about 34 feet per minute, and the action of the machine was noticeably smooth and steady. The side rocking often seen in single gang channelers was almost entirely absent. The "duplex" was warming up during the last days of the presidential campaign, and it is a commentary on the political complexion of the vicinity, as well as on the impression of power, strength and strenuosity made by this big channeler, as it roared up and down the track, that it was promptly christened the "BULL MOOSE."

To sum up, the new Sullivan duplex channeler has distinctly "made good" as a means of quarrying oölitic limestone, because:

1. It cuts from two and one half to three times as fast as the seven-inch single channeler.

2. Its power consumption (coal and water) is but little more than that needed for a single machine.

3. It uses no more labor than is needed by one single gang channeler.

4. Time is saved in laying track because of the decrease in vibration and for the same reason,—

5. Wear and tear to the machine is greatly reduced.

6. The 81¼-inch track gauge permits blocks of standard mill size to be cut without shifting track.

7. With the turntable, the channeler can be quickly reversed, without the use of a derrick.