varied, also the length of stroke, likewise the degrees of cushioning; whilst some have a brake fitted, which is actuated by the compressed air at the will of the operator. The purpose of the brake is to check the recoil of the machine after each blow. A typical description embodies the following: Say, a cylinder, 4 in. internal diameter, with a stroke of 12 in.; a valve-chest and valve, the latter being operated by the air-pressure; also cushioning arrangements, a piston and elongated rod with socket attached to the outer end, wherein the picks are placed as needed. To secure uniform alignment with this extra long rod, a guide attachment of proportionate length is fitted on to front end of the cylinder. It is also devised to prevent the rod turning. This insures the cutting-tool striking in the same manner each blow. The said tools or picks are generally sharpened in the form of the caudal-fin of a fish, and the cutting-edge is kept in a vertical position all the time. The height of these machines will range up to 2 ft. 6 in., and the length over all from 7 ft. to 8 ft. The machine is balanced on wheels of 18 in. diameter, thus admitting of its being readily moved about on the platform during holing operations. Suitable handles are fitted at the back end of the machine, and by these the "runner" is enabled to control and direct the machine as he requires. The platforms referred to are specially made of light timber, with a length of from 9 ft. to 10 ft. and width of 3 ft. 4 in. Each setting of the platform enables a radius of 6 ft. to the undercut.

The mode of operation is as follows: After the coal-face is rendered safe, either by trimming off all loose coal or securely timbering it, the operator and his assistant set the platform where required, the front end on the floor close to the face, and the back end raised either on a trestle or chocks of timber whereby to form an inclined plane towards the face. This inclination enables the operator to easily keep the machine to its work, and it also minimises the recoil resultant from each blow. The machine is then mounted on the platform and a flexible air-hose attached, one end to the machine, the other to air-pipes which are arranged in the working-place. It might here be stated that the air is conveyed underground from the compressing plant, which is situated on the surface, by pipes of suitable dimensions, varying in sizes from 5 in. down to 2 in. diameter, with intermediary air-receivers. These pipes are carried through the ramifications of the mines to the active workings; they are fitted with necessary valves and cocks whereby the air can be turned on or off as desired. The working-pressure at the machines is from 75 lb. to 80 lb. per square inch. After the hose is coupled and the air turned on at the pipe all is ready for action. The operator seats himself behind the machine, turns the air on thereat, grips the controlling-handles, and undercutting commences. Whilst holing is in progress the assistant shovels back the cuttings, thus giving the pick freedom of action. The undercut will range from 12 in. to 15 in. at the front, tapering to 2 in. or 3 in. at the back. A fair percentage of the holings are of good marketable size, especially those cut out at each "first stage" of the undercutting. After holing 6 ft. wide and to a depth of 5 ft., the air is shut off. The section just holed is then securely chocked and spragged, the platform is reset where required, and the machine placed thereon to repeat the aforenamed performance. The bords are usually driven 18 ft. wide, therefore three settings of the platform suffice for the holing of one bord. After a place is undercut as described, the machine is placed on a trolly and "flitted" to another bord which is ready to be holed. A general thing is to undercut two places, which means 180 square feet per shift; this does not truly represent the capacity of the machine, nor yet the ability of the skilled "runner," but it can be taken as a gauge of industrial legislative conditions under which the company operates.

A newer type of machine, called the "Champion Coal-cutter," has recently been placed in certain mines of the United Kingdom, after having been tried in Continental mines in "narrow" or winning-out work. The results are claimed as highly convincing. One of these machines is under trial by the Westport Coal Company, and so far the useful effect has been satisfactory. Whilst in actual work the Champion will hold its own with the other machines in the amount of undercutting accomplished in a given time. It is specially adapted for shearing or vertical cutting of the face. Under equal conditions, and all other things considered, such as time required for removal from place to place, the setting ready for work, and the actual work performed, this machine will doubtless, for vertical cutting, outclass any other type at present in operation. Under somewhat adverse conditions in a wet dip heading, the writer has a knowledge of this machine holing 6 ft. in width and 5 ft. 6 in. in depth in sixty-five minutes, and cutting up the face to a height of 7 ft. with a depth of cut 5 ft. 3 in. in forty-eight minutes. Considering the circumstances it was a reasonably satisfactory performance, and compares very favourably with hand-labour.

This machine is simply an adaptation of the percussive rock-drill, fitted with suitable lengthening-rods and cutting-tools for coal. The vertical supporting column can be readily fixed at required distances from the face; on the column is a longitudinal sleeve which can be fastened at any given height that it is desired to hole at. A toothed segment fits into the sleeve referred to and in the hub of the segment and axial therewith is a connecting-piece operated by worm gearing. To this connecting-piece the machine is securely fastened, and can be moved in a plane parallel to the segment by means of the worm gearing. When the segment is fixed horizontally the machine acts as a coal cutter or holer, when set vertically it will operate as a coal-shearer or vertical cutter. The air-cylinder is between 3 in. and 4 in. diameter, with a stroke of 8 in. The cutting-tool strikes about three hundred and fifty blows per minute. By means of the extension-rods it can be made to cut into the coal 7 ft. or 8 ft. with comparative ease, either horizontally or vertically. The heaviest part does not exceed 240 lb. in weight, so that it is favourable for "flitting" from bord to bord. Another feature is that this machine can be set to suit any vagaries of grade, or to hole in any height of the seam, it being merely a question of fixing the column at right angles to inclination of the floor, and the setting of longitudinal sleeve where desired on the column. The coal-cutters can be readily removed and drills substituted wherewith shot-holes can be drilled if required. Should the coal be thrown with wedges, the adaptability of the machine is again in evidence, as special wedges can be inserted into drill-holes, and a hammer-head fitted to the