equipped with some feeding device. In sampling mills the shaking-tray is generally used on account of the ease with which such feeders can be cleaned after each lot of ore has been run.

For fine-grinding machines, the coffee-mill type still successfully holds its own against most of the newer devices, although the modern sample-grinder is much heavier, better built, and more easily cleaned than its predecessors.

The first mechanical samplers were imitations of Cornish quartering, the "whistle-pipe" being the most common type. With ore finely crushed, fairly dry, well-mixed, and entirely free from strings and rags, and with the dividers new and exactly centering the pipe, fairly good results could be obtained by this method; but as these conditions never existed in practice, and as the edges of the cutters wore rapidly, thereby moving the dividing-line back from the center, this form of sampling-machine was soon discarded, and I believe has now fallen into absolute disuse.

Following the whistle-pipe sampler came the various forms of mechanical split-shovels; but as there was no place in a spout, no matter how wide or carefully built, where a single "U"-shaped spout could be placed to take a sample which would represent the entire width of the stream, this form also was soon discarded.

More recently this splitter has been revived by an adaptation of the ordinary hand-operated splitter (see Fig. 12), in which numerous small spouts are so arranged across the entire width of a larger one that the main ore-stream is divided into a great number of smaller ones, the even numbers being deflected to the right and the odd numbers to the left. This plan works very well on the first division, but as it effects a reduction of only 50 per cent. in the volume, the operation must be carried further, and the streamlets forming the sample centered into a broad stream, which, in turn, passes over another set of splitters, the operation being repeated as often as necessary to reduce the sample to the desired size. It has been found, however, that the mixture of the streamlets after their union is far from perfect, and that there is a considerable difference in the amounts of coarse and fines taken by the sample side of the second cutter, depending on its position relative to the cutter above. If the sample-compartments in the second cutter are directly below the sample-compartments in the overlying splitter, they receive the centers of the streamlets, while the "spread" passes into the reject, and the sample at each step in the bank of cutters receives an amount of fines slightly in excess of the average, thereby seriously affecting the value of the sample, provided there is, as is usually the case, a difference between the metallic contents of the coarse and the fines. Conversely, when each cutter in the bank is placed so as to take the "spread" from the cutter above it, the sample will have less than its due proportion of fines. This disadvantage could be obviated by placing a shaking-tray between each set of dividers, or perhaps even better by moving one divider horizontally across the other, so that each set of cutters would take all parts of the streams from the cutters above them. This arrangement, however, would require considerable headroom, and give a machine which would make a large amount of dust—a feature which is always objectionable in a sample-room.

The latest types of samplers are designed to overcome the difficulties just described, and are usually known as "time-sampling machines," from the fact that they deflect the entire stream into the sample-compartment for a varying portion of the time, depending on the percentage of sample required. Treating the falling stream of ore as a ribbon, they cut sample-sections directly across its entire width, these portions varying in shape and size with the mechanism employed. Of the many types that have been invented and patented, only three have come into general use, and Fig. 7 shows the shapes of the sample-sections taken by these three machines.

A represents a sample cut from the falling stream of ore by the Charles Snyder 20 per cent. sampler, with four radial intake-spouts, making 7.5 rev. (or 30 samples) per minute; delivery-spout 5 by 25 inches. (This sampler is not to be confounded with the Snyder sampler.) It will be seen, on this machine, that an attempt has been made to combine the old-fashioned continuous sample with the time-sampling system by arranging the delivery pipe and intake-spouts so that as one intake-

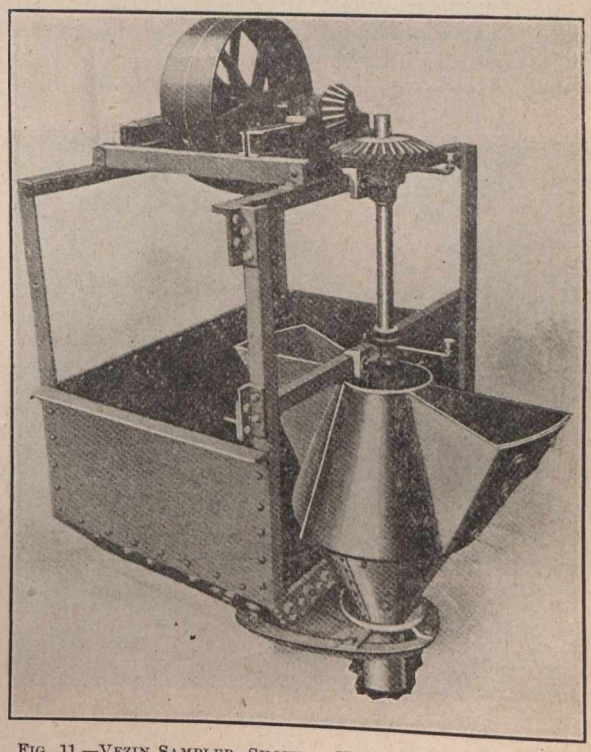

FIG. 11.—VEZIN SAMPLER, SHOWING HORIZONTAL CUTTING-EDGES

spout passes out of the stream another enters it on the opposite side.

B represents a Charles Snyder 20 per cent. sampler, with two radial intake-spouts, taking 15 samples per minute; delivery spout 5 by 25 inches. This machine does not take a continuous sample, but has the advantage that the intake-spouts, for a given percentage of sample, have double the width, and are therefore much less liable to throttle or choke; at the same time there is no reason why the sample should not be as accurate as that taken with the other type of Charles Snyder sampler.

C represents the sample taken by the Brunton 20 per cent. sampler, taking 54 samples per minute; delivery-spout 5.75 by 5.75 inches, cutting edges parallel.

D represents the sample from a Vezin 20 per cent. sampler with two radial intake-spouts, taking 30 samples per minute; delivery-spout 6 by 6 inches.

E shows the sample taken by a modified form of sector sampler, which, often through accident and sometimes by design, has come into too general use.

Both the Charles Snyder and the Vezin samplers have sector intake-spouts revolving on a vertical axis,