Even before the work on the program began, it was decided that the first trials would be made on chess problems. The solution of a problem by the program would be a very profitable experiment, and at the same time not too complex. One of the bases for a chess master’s strength is the calculation of variations; after this master capability had been formalized in the form of a program, it was subjected to an experimental trial by endgame studies. Some eleven compositions were prepared, but it turned out that we secured the information needed after only three experiments.

Figure 12  A problem due to Richard Reti. Draw.
It was assumed that the studies would represent an easy output for PIONEER, since they contained no positional niceties and all the variations could be pursued to the end. It was also assumed that no library of openings, middle games, nor endgames would be needed. In reality, things turned out to be much more complex.

On the first problem, a study by R. Reti (Fig. 12), PIONEER stumbled. The search tree grew, the variations did not reach an end, and PIONEER did not know which moves had priority. A chess master, however, knows when to break off a variation and which move to prefer for inclusion in the search—then his search tree is small indeed.

It was necessary to put rules into the program; these were founded on the well-known rule of the square. Then the search tree reduced to 54 nodes. If we had possessed a library of current positions, we could have avoided the repetition of variations, and the number of nodes could have been reduced to 45 (Fig. 14).

Some variations appear to be unfinished, but in fact they were carried to their logical ending—they were scored by modifications of the rule of the square that were put into the program.

PIONEER found difficulty in a problem by Botvinnik and Kaminer* (Fig. 13), despite the fact that it is very simple (I was 13 at the time we composed it and Kaminer was 14). It again turned out that if moves in the trajectories of the mathematical model are included in the search without analysis, PIONEER's search tree differs markedly from the one a master

*This problem has an amusing history. In 1925, when Sereža Kaminer and I developed it, I proposed that there should be a Pawn on square g6, but Sereža insisted that it should be a Bishop. He persuaded me, and the study was published with his text. In January 1977, in recalling this composition, I wrongly placed a Pawn on g6, and PIONEER solved the problem on the first variation.