The Tower of London (Part 2)

A map of London Tower is shown below. Every night at Midnight, a guard enters the portal marked G and marches through every one of the 64 rooms, ending at the black chamber.

By practice, the guard has discovered how to make this march without going through any room twice, and by making the fewest possible number of turns.

Can you find this route? How many turns did you have to make?

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