

both the short stop and second baseman are running to a line between home and second base and gaps 35 feet wide are left on both sides of the pitcher if the batter elects to hit. Consequently, if the attacking team decides to play hit and run instead of the double steal, and the defenders have been led to expect an attempt at the latter play, the chances of the batter hitting safe are tripled.

Late in the season, after the men know each other and the opponents perfectly, the infielders frequently discard the signals, having become so familiar with the plays and the style of making them that they know exactly what to do without signaling. Evers and Tinker of Chicago play entire games without looking at each other except when an unknown batter comes up to hit.

But to get back to that millionth of a watt and the geometry of the game. The average "fan" thinks that about four out of every five batters hit fly balls. Managers growl all the time for the batters to "hit 'em on the ground," the theory being that more hits go safe on the ground than in the air. It is true more runners reach first base on ground hits than on fly balls, but the percentage of safe hits largely favors aerial batting. This is because so many grounders are fumbled and so few flies muffed.

This involves another study of angles, and an entirely new departure in infield defensive work. To discover what proportion of balls are hit on the ground, I took a mass of score books and classified 10,000 batted balls, every team in the National and American Leagues being represented in the figures. Really I scored 10,074 plays, because the number ran over unexpectedly and I did not know which 74 to deduct. Of them, 3,602 were fly balls, 5,171 were grounders, 344 were bunts, and 957 line drives, as distinguished from flies. Of the 10,074 balls batted, 2,067 were scored as base hits. Of the 3,602 fly balls, 747 fell safe and only 18 were muffed, which shows that the fielders

upon. Of the 5,171 ground balls, 424 were scored hits. Of the 344 bunts, 155 went safe, and of those 155 the fielders got their hands on 114. Of the 957 line drives, 741 resulted in safe hits.

But to show the ground-covering ability of the infielders further calculation is necessary. In scoring, I place a small "T" above hits I believe too hard to handle, and a small "D" over hits which are doubtful either through bad bounding of the ball or other cause. Of the 424 hits through the infield, 162 were marked "T" and 49 were marked "D." So the players reached the ball 211 times and failed to field it; and of the 213 times the ball went through untouched 46 were plain hit and run plays in which fielders were going the wrong way, in other words, blundering or being outgeneraled by the batsman.

Out of the 5,171 grounders the players actually reached all except 213, or about .041 per cent., whereas on the natural chances of covering the ground they should have reached only about 800 per cent. instead of 959 per cent. of batted balls. The figures seem to show that by team work they were enabled to get in touch with 159 per cent. more batted balls than the geometry of the diamond would indicate.

The geometry of the game becomes more complex the deeper it is studied. Not only must the players on the infield know when to start in a given direction, but they must know exactly what angle to take to meet each ball. Further, they must change the angle to meet the running speed of each batter. If, for instance, "Larry" McLean, of Cincinnati, hits the ball, a second baseman will run backward, his path and the path of the ball meeting in an acute angle. If Miller Huggins is the batter he will run forward, making the lines meet in an obtuse angle. Moreover, they know to a nicety just where they must meet a ball of any given speed, and they start there almost instinctively. Oddly enough, the men can go much faster toward certain points than to-

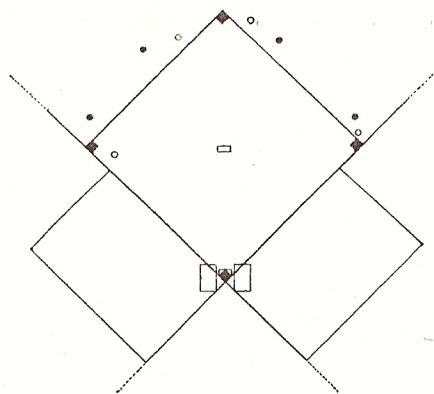
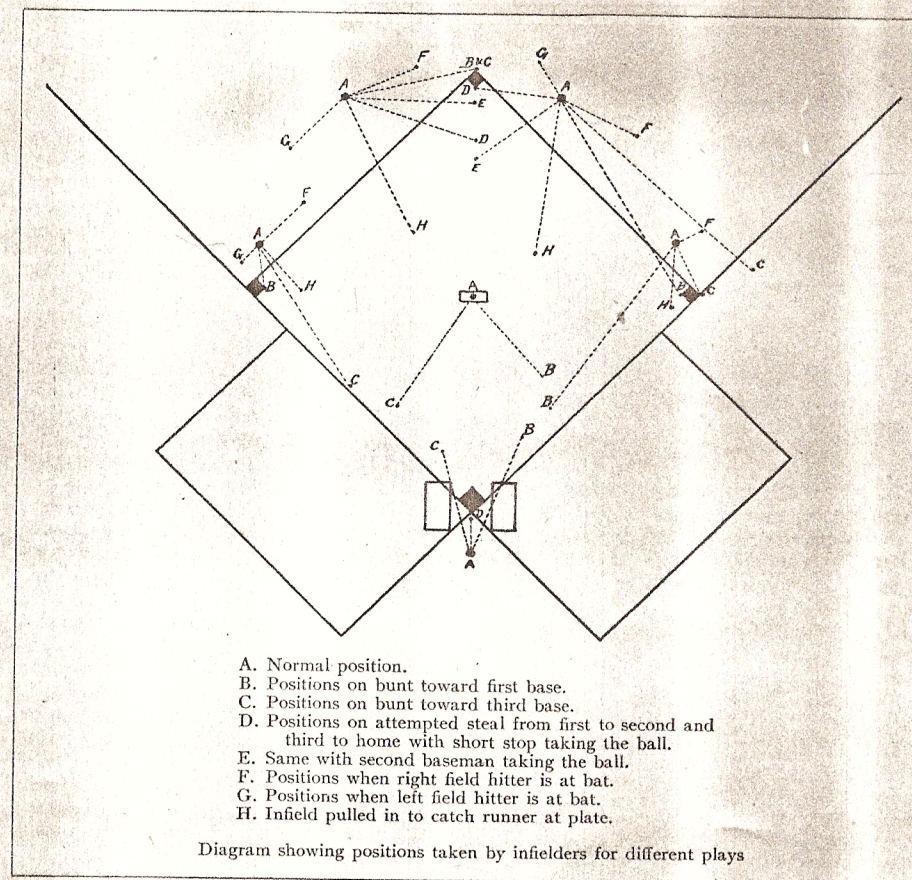


Diagram showing how base runners "tie up" fielders and make hits more likely. Black dots show positions of players when no one is on the bases; white dots show position of players holding up runners when there are men on first and second and no one out.



ward others, even when they are of equal speed, and they can, if they judge the speed of the ball and the runner, close up the gaps still further by reaching the spot in the ball's path toward which they can travel fastest. But all that is mechanical. It is supplementing instinct by brain work that makes great baseball

players. It is the inside game which calls the mind into play to extend the reach of the arms. Therefore, as Mr. Euclid, who invented diamonds, would say: If X covers 24 feet with his arms and legs and 18 with his brain, Y, the base-runner, is out, provided Z, the umpire, does not call him safe. Q. E. D.

*Mr. Fullerton will continue to write baseball articles for this magazine. "The Wonders of Pitching" and "Batting" will appear in early issues.*