The second fort was on the point where the river turns at Mayport. The Spaniards evidently held back for a time before leaving the fort, which gave De Gourgues time to cross the river and station himself in the woods around the property known as "Wonderwood."

The French removed the articles of value from this fort and sent them across the river. Then they crossed over themselves, with their captives and their Indian allies. De Gourgues wished to obtain more accurate information about the great fort before attacking it. He learned from one of the prisoners that it contained about 250 men, well armed and supplied, and this information was substantiated by a spy sent from the great fort, who had been captured by the Indians and brought in. De Gourgues decided to make the attack at once, although it could not be made as a surprise, for the Spaniards had already gotten wind of the attacks on the small forts. In the night he sent the Indians to conceal themselves in the woods behind the great fort and await the signal for attack. Early the next morning he crossed the river with all of his force, except a few left to guard the prisoners, and finally attained the eminence (St. Johns Bluff) overlooking the fort—the same position from which Menendez on that fatal morning two and a half years before observed Fort Caroline.

De Gourgues saw a reconnoitering party of 60 Spaniards leave the fort and march toward his position, whereupon he sent Captain Cazenove around to come up in their rear and cut off their retreat. This maneuver was carried out unobserved by the Spaniards, who continued toward De Gourgues' position on the hill. When they were close, De Gourgues advanced with his whole force. The Spaniards broke and fled, but Cazenove had cut off their retreat and all were slain without quarter.

The balance of the garrison in the fort got a glimpse of what was taking place in the woods on the slope of St. Johns Bluff and in their consternation the number of the French was greatly magnified. Becoming demoralized they sought escape through the woods behind the fort; here they ran into the Indians, who attacked them with the greatest fury. The French soon joined the Indians in the work of extermination. Only a few Spaniards escaped; most of them were slain.