Least-Squares Normal Distribution to the Binomial Distribution:
Objective function:

$$f(\mu,\sigma) = \sum_{k=0}^{n} \left(\frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(k-\mu)^2}{2\sigma^2}} - \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k} \right)^2$$

where n = 240, p = 0.85.
Record of calculations:

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dig = 4
N = 10

Step 1:
mu = 204;
sigma = 5.5;
Initial segment for mu: [203.5, 204.5].
Initial segment for sigma: [5, 6].
The length of the segments = 1.
The length of the subsegments = 0.1.
Output:
Minimal value of the objective function: f = 1.8980182517855E-5
mu = 204.2
sigma = 5.5

Step 2:
Segment for mu: [204.15, 204.25].
Segment for sigma: [5.45, 5.55].
The length of the segments = 0.1.
The length of the subsegments = 0.01.
Output:
Minimal value of the objective function: f = 1.7275664599615E-5
mu = 204.18
sigma = 5.53

Step 3:
Segment for mu: [204.175, 204.185].
Segment for sigma: [5.525, 5.535].
The length of the segments = 0.01.
The length of the subsegments = 0.001.
Output:
Minimal value of the objective function: f = 1.7256264710677E-5
mu = 204.175
sigma = 5.532

Step 4:
Segment for mu: [204.1745, 204.1755].
Segment for sigma: [5.5315, 5.5325].
The length of the segments = 0.001.
The length of the subsegments = 0.0001.
Output:
Minimal value of the objective function: f = 1.7255876530462E-5
mu = 204.1755
sigma = 5.5316

Step 5:
Segment for mu: [204.17545, 204.17555].
Segment for sigma: [5.53155, 5.53165].
The length of the segments = 0.0001.
The length of the subsegments = 1.0E-5.
Output:
Minimal value of the objective function: f = 1.7255876443792E-5
mu = 204.17549
sigma = 5.5316

Answer:
mu_L = 204.17549
sigma_L = 5.5316