and regarding S_0 as the principal intermediate. The sentential forms are now identical to the k-sentential forms as defined above, and this is a decided convenience.

Our construction is based on the notion of a "state," which will be denoted by $[p, j; \alpha]$; here p is the number of a production, $0 \leqq j \leqq n_p$, and α is a k-letter string of terminals. Intuitively, we will be in state $[p, j; \alpha]$ if the partial parse so far has the form $\beta X_{p1} \cdots X_{pj}$, and if $\mathcal{G}$ contains a sentential form $\beta A_p \alpha \cdots$; that is, we have found j of the characters needed to complete the pth production, and α is a string which may legitimately follow the entire production if it is completed.

At any time during translation we will be in a *set* $\mathcal{S}$ of states. There are of course only a finite number of possible sets of states, although it is an enormous number. Hopefully there will not be many sets of states which can actually arise during translation. For each of these possible sets of states we will give a rule which explains what parsing step to perform and what new set of states to enter.

During the translation process we maintain a *stack*, denoted by

$$\mathcal{S}_0 X_1 \mathcal{S}_1 X_2 \mathcal{S}_2 \cdots X_n \mathcal{S}_n \mid Y_1 \cdots Y_k \omega. \tag{17}$$

The portion to the left of the vertical line consists alternately of state sets and characters; this represents the portion of a string which has already been translated (with the possible exception of the handle) and the state sets $\mathcal{S}_i$ we were in just after considering $X_1 \cdots X_i$. To the right of the vertical line appear the k terminal characters $Y_1 \cdots Y_k$ which may be used to govern the translation decision, followed by a string ω which has not yet been examined.

Initially we are in the state set $\mathcal{S}_0$ consisting of the single state $[0, 0; \dashv^k]$, the stack to the left of the vertical line in (17) contains only $\mathcal{S}_0$, and the string to be parsed (followed by $\dashv^k$) appears at the right. Inductively at a given stage of translation, assume the stack contents are given by (17) and that we are in state set $\mathcal{S} = \mathcal{S}_n$.

Step 1. Compute the "closure" $\mathcal{S}'$ of $\mathcal{S}$, which is defined recursively as the smallest set satisfying the following equation:

$$\begin{aligned} \mathcal{S}' = \mathcal{S} \cup \{[q, 0; \beta] \mid {} & \text{there exists } [p, j; \alpha] \text{ in } \mathcal{S}', j < n_p, \\ & X_{p(j+1)} = A_q, \text{ and } \beta \text{ in } H_k(X_{p(j+2)} \cdots X_{pn_p}\alpha)\}. \end{aligned} \tag{18}$$

(We thus have added to $\mathcal{S}$ all productions we might begin to work on, in addition to those we are already working on.)