This diagrammatic method has, however, serious inconveniences as a method for solving logical problems. It does not show how the data are exhibited by canceling certain constituents, nor does it show how to combine the remaining constituents so as to obtain the consequences sought. In short, it serves only to exhibit one single step in the argument, namely the equation of the problem; it dispenses neither with the previous steps, *i. e.*, "throwing of the problem into an equation" and the transformation of the premises, nor with the subsequent steps, *i. e.*, the combinations that lead to the various consequences. Hence it is of very little use, inasmuch as the constituents can be represented by algebraic symbols quite as well as by plane regions, and are much easier to deal with in this form.

49. **The Logical Machine of Jevons.**—In order to make his diagrams more tractable, VENN proposed a mechanical device by which the plane regions to be struck out could be lowered and caused to disappear. But JEVONS invented a more complete mechanism, a sort of *logical piano*. The keyboard of this instrument was composed of keys indicating the various simple terms ($a$, $b$, $c$, $d$), their negatives, and the signs $+$ and $=$. Another part of the instrument consisted of a panel with movable tablets on which were written all the combinations of simple terms and their negatives; that is, all the constituents of the universe of discourse. Instead of writing out the equalities which represent the premises, they are "played" on a keyboard like that of a typewriter. The result is that the constituents which vanish because of the premises disappear from the panel. When all the premises have been "played", the panel shows only those constituents whose sum is equal to 1, that is, forms the universe with respect to the problem, its logical whole. This mechanical method has the advantage over VENN's geometrical method of performing automatically the "throwing into an equation", although the premises must first be expressed in the form of equalities; but it throws no more light than the geometrical method on the operations to be per-

formed in order to draw the consequences from the data displayed on the panel.

**50. Table of Consequences.**—But PORETSKY's method can be illustrated, better than by geometrical and mechanical devices, by the construction of a table which will exhibit directly all the consequences and all the causes of a given equality. (This table is relative to this equality and each equality requires a different table). Each table comprises the $2^n$ classes that can be defined and distinguished in the universe of discourse of $n$ terms. We know that an equality consists in the annulment of a certain number of these classes, viz., of those which have for constituents some of the constituents of its *logical zero* $N$. Let $m$ be the number of these latter constituents, then the number of the sub-classes of $N$ is $2^m$ which, therefore, is the number of classes of the universe which vanish in consequence of the equality considered. Arrange them in a column commencing with 0 and ending with $N$ (the two extremes). On the other hand, given any class at all, any preceding class may be added to it without altering its value, since by hypothesis they are null (in the problem under consideration). Consequently, by the data of the problem, each class is equal to $2^m$ classes (including itself). Thus, the assemblage of the $2^n$ classes of discourse is divided into $2^{n-m}$ series of $2^m$ classes, each series being constituted by the sums of a certain class and of the $2^m$ classes of the first column (sub-classes of $N$). Hence we can arrange these $2^m$ sums in the following columns by making them correspond horizontally to the classes of the first column which gave rise to them. Let us take, for instance, the very simple equality $a = b$, which is equivalent to

$$ab' + a'b = 0.$$

The logical zero ($N$) in this case is $ab' + a'b$. It comprises two constituents and consequently four sub-classes: 0, $ab'$, $a'b$, and $ab' + a'b$. These will compose the first column. The other classes of discourse are $ab$, $a'b'$, $ab + a'b'$,