To obtain continuity of girder structure with precast reinforced concrete girders, across a plurality of columns, and also to obtain continuity in precast reinforced concrete column structure, is a costly procedure which ordinarily involves welding the ends of the reinforcing in the girders to the reinforcing that is embedded in the concrete columns. In such an arrangement of precast girders, they have a length only substantially equal to the distance between each pair of columns.

My invention has for one of its objects the provision of columns and girder structure of such form that each girder may extend continuously across a plurality of columns, in lengths of up to perhaps 100 feet and each of the columns may extend from foundation to roof as one concrete unit, made by one casting operation, so that there are no horizontal seams or planes of weakness in the columns.

Another object of my invention is to provide an improved arrangement for assembling and supporting floor slabs, roofing slabs or the like, on the girders, with the upper faces of the slabs at the same level as the upper faces of their supporting girders, and girdler-supporting ledges on the columns that do not extend below the lower faces of the girders.

In the accompanying drawings, Figure 1 is a fragmentary side elevational view of concrete structural work embodying my invention:

Fig. 2 is a sectional plan view thereof;
Fig. 3 is an enlarged view taken on the line III—III of Fig. 1;
Fig. 4 shows a modification of the structure of Fig. 3, taken on the line IV—IV of Fig. 5;
Fig. 5 is a plan view of the structure of Fig. 4;
Fig. 6 shows a modification of the structure of Fig. 4, and
Fig. 7 is a sectional plan view showing the manner in which outside wall girders and floor girders may be supported on the columns.

Referring first to Figs. 1, 2 and 3, reinforced concrete columns 10 have ledges or brackets 11 cast integrally therewith, dowel pins 12 being embedded therein.

The ledges 11 serve as supports for the reinforced concrete girders 13 of generally Z-form in cross section, as shown more clearly in Fig. 3. The upper legs 14 of the girders are relatively short compared to the web portion and the lower leg 15 thereof, since the legs 14 extend only between the columns 10 while the web 13 and the leg 15 extends the full length of the girder for perhaps 30 to 100 feet. In the case of the longer girders, I may slit the leg 15, as at 15a, to prevent warping through uneven shrinkage.

Without greatly weakening the structure, I am able to notch the upper legs or flanges of the girders to fit the columns. The compression of the upper legs of the girders is zero at the columns, and I can slit the lower leg of the girder at 15c, mid-way between columns, the compression at those points is zero. The maximum compression of the bottom legs is at the columns, and the maximum compression of the upper leg is at the middle of each bay or half-way between the columns.

As only the upper one-third of a non-prestressed reinforced concrete beam or girder is in compression, I can, by using outwardly and inwardly-extending legs that are integrally cast to the girders, greatly reduce the depth of a girder that would otherwise be required for a given strength. Also, it is to be noted that the supporting brackets or ledges as at 11 do not extend below the bottom of the girders.

Short sections 16 of pipe are embedded in the legs 14 to receive the dowels 12. The lower leg 15 of the girder serves as a ledge or shelf to support floor or roof members 17 that will extend from one girder to another girder.

By making the girders of Z-shape, I am able to secure maximum strength with an economy of concrete. This is because I am able to reduce the vertical depth of the girder, as only the upper one-third thereof (in a non-prestressed girder) is in compression, and the lower one-third thereof, which is under tension, is strengthened by the leg 15. There will, of course be a girder 13 at each side of the columns 10.

Referring now to Figs. 4 and 5, I show a girder 20 of what might be termed double-Z form. This girder has a central hole through which a column 10 extends and has its vertical leg portions 21 resting upon ledges 22 formed on the column. The legs 21 are extended to support the ends of the members 17.

In Fig. 6, I show an arrangement wherein the girders have their upper leg portions 23 extending between columns 24, but their body portions 25 and lower leg portions 26 being continuous, the girders being secured to the columns by bolts 27 that extend through the columns.

Referring now to Fig. 7, I show an arrangement wherein in a floor girder 28 and an outside wall girder 29 are supported by a column 30, upon ledges or brackets 31 and 32 that are carried by said column.

I claim as my invention:

1. A building structure including a plurality of laterally spaced columns having means for supporting a continuous girder thereon, said girder having a vertical web abutting the corresponding faces on a side of said columns and an upper flange integral with and projecting inwardly from one vertical surface of said web, the ends and intermediate portions of said upper flange substantially abutting the opposing faces of the columns, a lower flange substantially coextensive in length with said web on said girder, said lower flange being integral with and projecting outwardly from the other vertical surface of said web and being in substantially parallel relation to said upper flange, the side of said web including the lower flange being unobstructed above said lower flange.

2. A building structure as recited in claim 1, wherein said columns extend continuously past a plurality of vertically spaced girders.

3. A building structure as recited in claim 1, wherein said upper flange has a width substantially equal to one-half the width of the said faces of the columns.

4. A building structure as recited in claim 3 and fur-
ther including a similar continuous girder on the other side of the columns resting on said means, the upper flanges of the two girders substantially abutting along a center line between the inner and the outer sides of the columns.

5. A building structure including a plurality of laterally-spaced reinforced concrete columns, girder-supporting members on the columns, precast reinforced concrete girders having integral upper flange-like portions and resting upon said members, said girders extending continuously past several columns, the flange-like girder portions having openings therein, said columns extending through said openings, said girders further including integral vertical webs disposed against the inner and outer faces of the columns, and lower flanges integral with said webs and projecting outwardly of said webs and said columns.

References Cited in the file of this patent

UNITED STATES PATENTS

913,083 Wilcox ------------------ Feb. 23, 1909
976,182 Jones ------------------ Nov. 22, 1910
1,031,047 Conzelman -------------- July 2, 1912
2,618,146 Ciarlini --------------- Nov. 18, 1952

FOREIGN PATENTS

134,591 Great Britain --------- Oct. 29, 1919