When the novel means are applied to an existing column, the central core may be formed by this column already in situ.

The reinforcing may very conveniently be made out of mild steel rods, a suitable size of rod, for example, being three eights of an inch diameter. These rings are easily and cheaply bent cold from rods of such length that the ends overlap. The sleeve in the metal easily allows of these ends being temporarily separated from each other to allow of the ring being slipped sidewise over the vertical core. These rings are in series preferably arranged spirally around the core so as to form opposing members which act together across the center of the pillar, their distance apart, vertically, being fixed in accordance with the work they may have to do. The rings may be embedded in the plastic concrete as it is filled into the temporary incasing mold, or they may first be fixed in position then the usual shuttering and the concrete be finally run in around them.

It is clear that rings thus formed may be used either upon a core formed by an existing metal column or upon a core around which a concrete column is to be built. As already stated and as hereinafter explained, they may also be used without a vertical metal core, and it is further to be understood that the so-called rings are not of necessity open ended, nor are they of necessity formed of material of circular cross-section—the invention is obviously not limited in either of these directions.

In order that the invention and the manner of performing the same may be properly understood, there are hereto appended three sheets of explanatory drawings showing in plan in Fig. 1 and in elevation in Fig. 2 an example of a column with the improved reinforcing means arranged about an axial core in perspective in Fig. 3 an example of so-called ring, and in plan in Fig. 4. Sheet 2 an example of a column with the improved reinforcing means arranged about a hollow axial core—which may well be an existing cast-iron column.

In Fig. 5 Sheet 2 is shown an example of column in which there is no axial core, and in Fig. 6 Sheet 2 is shown perspective an
example of ring for use therein. In Figs. 7 and 8 Sheet 2 are shown like views of another coreless example. In Figs. 9 and 10 Sheet 2, and 11 and 12 Sheet 3 are shown like views of further alternative methods. And in Figs. 13 and 14 Sheet 3 are shown in plan respectively a modified ring and the arrangement of a series of them in a column.

In the example shown in Figs. 1, 2 and 3 in which in Figs. 1 and 2 the outline of the column is indicated by dotted lines A, and in Fig. 3 the core of the column by dotted lines B, the rings which are circular and which are formed by the bending of round steel bars of such length that their ends overlap as shown in Fig. 3 are assembled during the building of the column—usual shuttering being used—in horizontal planes radially about an axial core C one above another. The rings being open-ended may easily be sprung laterally into position upon the core whether that consists of an old column perhaps not accessible from the end or of a new core just erected. Each ring thus embraces a mass of concrete which is put in compression by any outward radial strain tending to distort the ring and so reduce its contained area. A radial strain obviously also induces tensile stress in the ring. Thus both materials are subjected to those strains which they can the most adequately resist—the metal to tension and the concrete to compression. Furthermore, the rings, adequately anchored axially by their embracing the axial core further resist radial outward movement for that reason. Obviously the radial angular intervals between the rings and also the vertical axial intervals between them may be anything desirable and commensurate with their relative sectional strength, the area they embrace and the external conformation of the column or the like. Again, it is quite clear that two conditions are fulfilled so long as the so-called rings are of a figure the contained area of which is diminished by their radial extension.

The outward radial strain above referred to upon the rings is of course brought about on the one hand by the bending of the metal core which they embrace to swell under compression and on the other hand by the like tendency of the concrete.

Fig. 4 differs only in showing the reinforcing rings arranged about a hollow axial core B instead of a solid axial core.

In Fig. 5 is shown an example in which there is no axial metal core. In this case the rings are in effect and as effectively anchored by that central area C of concrete which they all jointly embrace in closely adjacent horizontal planes and by which they are in effect interconnected, the concrete in this central area being obviously put in compression by any radial stress upon the rings. As a further anchorage, the ends D of the rod from which the ring is formed may be respectively up- and down-turned as shown in Fig. 6.

In Figs. 7 and 8 is shown a central-coreless arrangement in which the rings (figures-of-eight as shown perspective in Fig. 8) are physically interconnected in the axis of the column. Here of course, radial stress on one ring is transferred as a whole across the center to its interconnected diametrical follow.

In the foregoing examples the core has been one mass of metal or concrete in the vertical axis of the column. It is however apparent that the advantages of the construction can be retained where the core mass is subdivided, that is to say where the core as a whole consists of a series of subcores disposed about the axis and the mean center of the area embraced by which is axially coincident. Such cores—metal or concrete—bound together by the mass in which they are embedded obviously fulfill—although perhaps not in so perfect a manner—the functions of a definite axial core.

An example of this plural-core construction is shown in Fig. 9. Here the sub-cores E are formed by those areas of concrete enmeshed by the rings and interconnected by the rings with an axial concrete core F.

The example shown in Fig. 10 differs only in that metal rods G pass through the sub-cores, the mean center of the area embraced both by the metal cores and by the concrete core is axial. Again in Fig. 11 is shown an example having four metal cores H effectively tied against radial movement by rings K and by the enmeshed masses of concrete in compression. The example shown in Fig. 12 differs only in the omission of the metal cores H, the central mass of concrete and the eccentrically placed rings being effectively tied together by the rings K, the concrete masses being in compression and the rings in tension as they should be.

In Fig. 13 is shown a ring not in itself of such form or so placed that extension radially to the column axis reduces its contained area—in fact, such extension up to a certain point increases its area—but by which, when enmeshed with others like it about the axis of the column (as shown in Fig. 14) there are formed between the enmeshing inter parts areas L, M, which are reduced by radial extension of the rings. Thus the conditions set forth are fulfilled while the form as indicated in Fig. 14 is very suitable for a column of circular section.

According to existing methods of constructing ferro-concrete pillars a number of vertical reinforcing rods are employed which are distributed within the concrete at intervals near its outer surface and are horizontally laced or spirally wound with...
metal wires or straps to form a cage-like structure, which is used to provide the reinforcement to resist bulging strains induced by compression. But the strength of this reinforcement in which the strains have to pass around the pillar is necessarily less than that of reinforcement in which the strains can be transmitted direct across the center of the pillar between opposite sides or angles. Then again as the compressive strength of the multiple vertical reinforcing members cannot be utilized beyond the safe comprehensive strength of the reinforced concrete, they are therefore, as vertical members, of no special value for taking compressive strains. According to this invention the reinforcement is so arranged that the strains due to bulging pressures are transmitted between opposite sides or angles, direct across the center of the pillar. Only one vertical rod therefore requires to be used as a core and this need not be of greater strength than that necessary to efficiently transmit the pull of opposing rings, and even this core may be omitted if the rings be otherwise connected or coupled so as to enable them to transmit the strains between opposite sides direct across the center of the pillar.

What we claim is:

1. Reinforcing means for concrete columns and the like, comprising ring-like members arranged radially and eccentrically about the axis of the column and of such figure and so disposed that the areas embraced by them are reduced by the radial extension of the figures, in combination with a core interconnected with said ring-like members and axial to the column.

2. Reinforcing means for concrete columns and the like, comprising ring-like members arranged radially and eccentrically about the axis of the column and of such figure and so disposed that the areas embraced by them are reduced by the radial extension of the figures, in combination with a core interconnected with said ring-like members, said core comprising a plurality of sub-cores the mean center of the area embraced by which is axial to the column.

3. Reinforcing means for concrete columns and the like, comprising ring-like members arranged radially and eccentrically about the axis of the column and of such figure and so disposed that the areas embraced by them are reduced by the radial extension of the figures, in combination with a core interconnected with said ring-like members and axial to the column, said core comprising at least one metal core element extending longitudinally of the column.

4. Reinforcing means for concrete columns and the like, comprising a series of figures consisting of round section rods bent to ring-like form and of such length that their ends overlap, the figures being arranged radially and eccentrically about the axis of the column, and interconnected therewith a core the mean center of which is axial.

5. Reinforcing means for concrete columns and the like, comprising a series of figures consisting of round section rods bent to ring-like form and of such length that their ends overlap with one end up-turned and the other down-turned, the figures being arranged radially and eccentrically about the axis of the column and interconnected therewith a core the mean center of which is axial.

6. Reinforcing means for concrete columns and the like comprising a series of figures consisting of rods bent to figure of eight double ring-like form so that they are interconnected in the axis of the column by their physical connection the one with the other, the figures being arranged radially and eccentrically about the axis of the column, and interconnected therewith a core the mean center of which is axial.

7. Reinforcing means for concrete columns and the like comprising a series of figures consisting of rods bent to figure of eight double ring-like form so that they are interconnected in the axis of the column by their physical connection the one with the other, the rods being of such length that their ends overlap and the figures being arranged radially and eccentrically about the axis of the column, and interconnected therewith a core the mean center of which is axial.

8. Reinforcing means for concrete columns and the like comprising a series of figures consisting of rods bent to figure of eight double ring-like form so that they are interconnected in the axis of the column by their physical connection the one with the other, the rods being of such length that their ends overlap with one end up-turned and the other down-turned, and the figures being arranged radially and eccentrically about the axis of the column interconnected therewith a core the mean center of which is axial.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses:

ROBERT THOMSON.
WILLIAM AFFLECK THOMSON.

Witnesses:
DAVID FERGUSON.
JAMES EAGLESON.