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II

GROUP 1, SUB-GROUP a.

WELDED STEEL CONSTRUCTIONS IN POLAND IN 1934.

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During the past few years the use of welding in Poland in steel construction has increased considerably. Technical legislation, on the one hand, has created legal conditions favourable to the development of this branch of industry, while on the other hand, nearly all workshops adapted themselves to the new conditions, installing the necessary welding equipment and modernising plant. Last year (1934), for instance, witnessed the erection of many buildings, among which may be mentioned as being most important :

(1) The Military Quarters Fund Building in Warsaw.
(2) The Military Navy Building in Warsaw.
(3) The Jagellonian Library in Cracow.
(4) The foot bridge in Gdynia.

The first two buildings are of a similar type ; both have steel frames, and in each case the outside walls are of masonry. Inside, the building is supported on steel columns ; indeed, steel frames have been used throughout the entire building.

The building of the Military Quarters Fund (Fig. 1) has seven storeys above the ground level and is 27 m. high ; it has 2355 sq. m. of ground area. The façade of the building faces three streets and is 179 m. long, with arcades built all along its length.

The average width of the building is 5·70 m./4·20 m. = 11·90 m. The ceilings rest upon one, and at places upon two rows of columns. The latter are mostly channel irons (Fig. 2) reinforced near the base by steel plates, thus forming a closed box section, in which the material is removed as far as possible from the neutral axis, in both directions, when it is then in the best position to resist buckling. This type of section cannot be obtained when rivets are used. The columns rest on plates 30 to 60 mm. thick, and are welded to them. In the upper storeys both the adjacent channel sections are joined together, at intervals of 400–600 mm., by means of plates.

The principal girders run parallel to the main elevation and rest on the columns. These girders consist of either single **I**-beams or of two channel irons, sometimes also of two channel irons and one **I**-beam. A greater load or an increase in length requires, however, the use of

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stronger beams in some places. Rolled beams were therefore reinforced by welding plates, but even this did not always prove sufficient, especially since the thickness of the ceiling was limited. Welded beams of

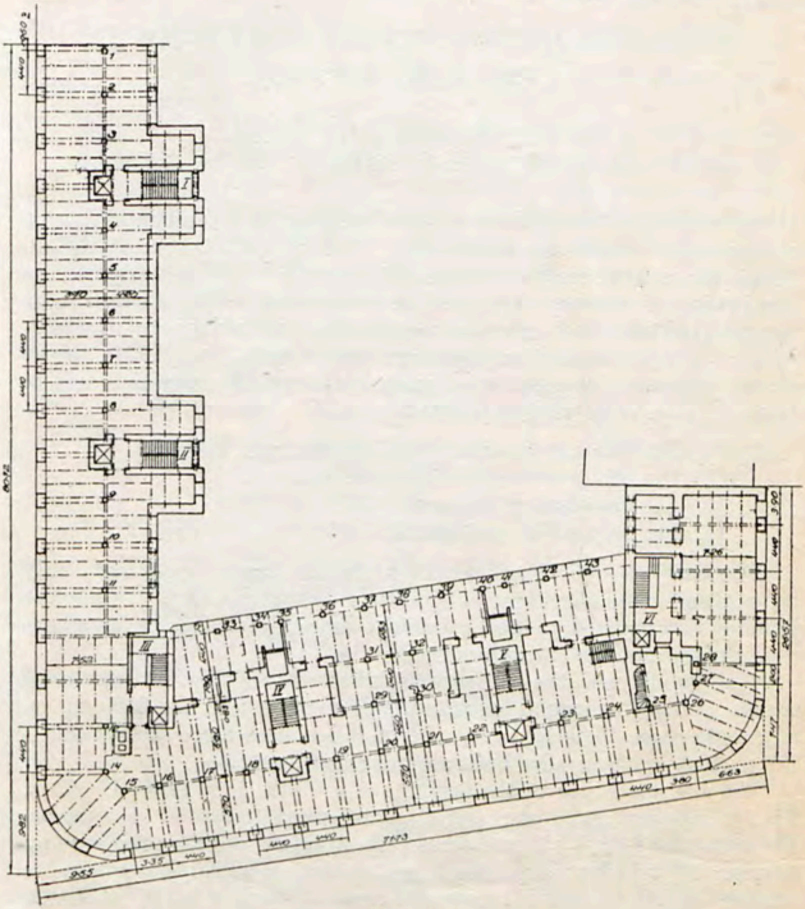

Fig. 1.

steel plates were used at such places, either double-webbed or with a box section, constructed of steel plate up to 30 mm. thick.

At places where the main girders are in triplicate, the centre beam passes through the centre of the column, and the outer beams rest upon supports provided by cutting out openings in the side plates of the columns and inserting an **I**-beam, the shape of which is shown in Fig. 3. The columns are generally two storeys high, but the lowest ones pass through three floors. The beams rest on the main girders, and are on the whole regularly spaced, with the exception of the corners of the building, which are rounded, and where the disposition of the

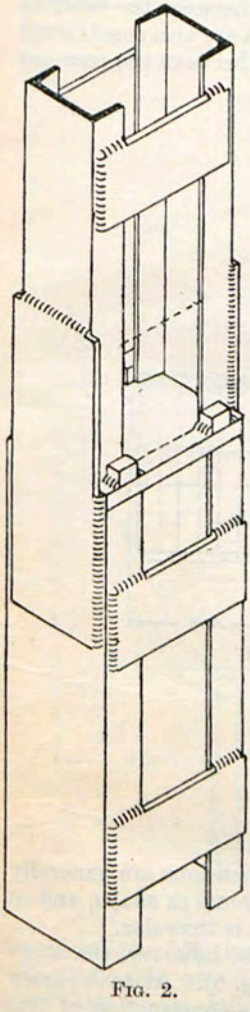

Fig. 2.

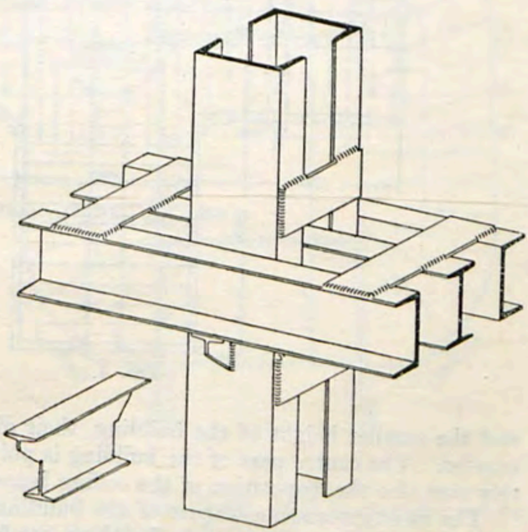

Fig. 3.

beams must be adapted to those conditions. A departure from the general layout can be also observed in the low storey above the ground floor, where curved beams were used, as architectural design required their visibility. The weight of the steel welded construction is about 650 tons.

The principles of construction of the framework of the Military Navy Building are nearly the same. The ground plan, however, is in this case cruciform in shape, with equal arms, and the columns are placed in double rows in each wing of the building (see Fig. 4).

Owing to the architectural design, the intervals between the columns are small and do not exceed 2·60 m. The columns are also constructed of channel irons. In view of the shorter intervals between the columns

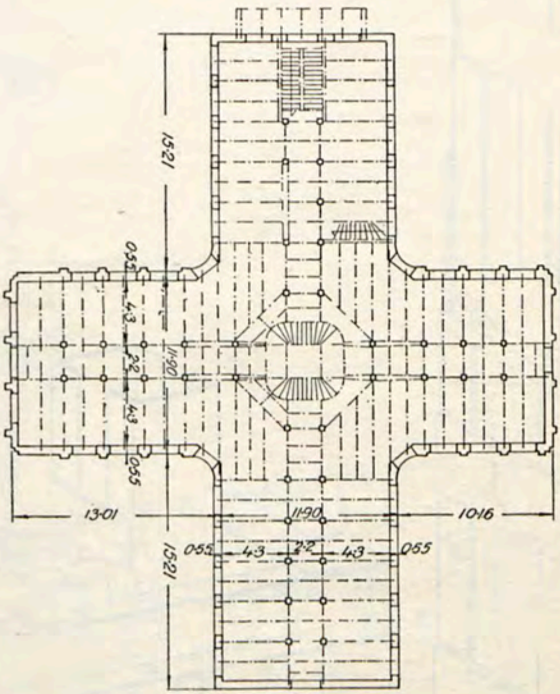

Fig. 4.

and the smaller height of the building, their dimensions are generally smaller. The centre part of the building is polygonal in shape, and in this case also the disposition of the ceiling beams is irregular.

The most interesting feature of the building is, however, the staircase occupying the centre of the building (see Fig. 5). At each storey a gallery runs round this circular staircase. The construction of this staircase is original in that it rests on beams from the main girders of the ceiling at one end and is suspended between the storeys by two steel bars, made of rolled flats, 80 × 25 mm., at the other end. As the staircase is round in shape and the height and the width of the staircase beam were limited, it was necessary to shorten its length. In order to do this, the ceiling beams were moved forward as far as the maintainence of equilibrium permitted and the staircase beams were fixed to it at the joints. Moreover, the staircase beams were made of a rectangular section, 24–50 mm. wide, varying in height according to the architec-

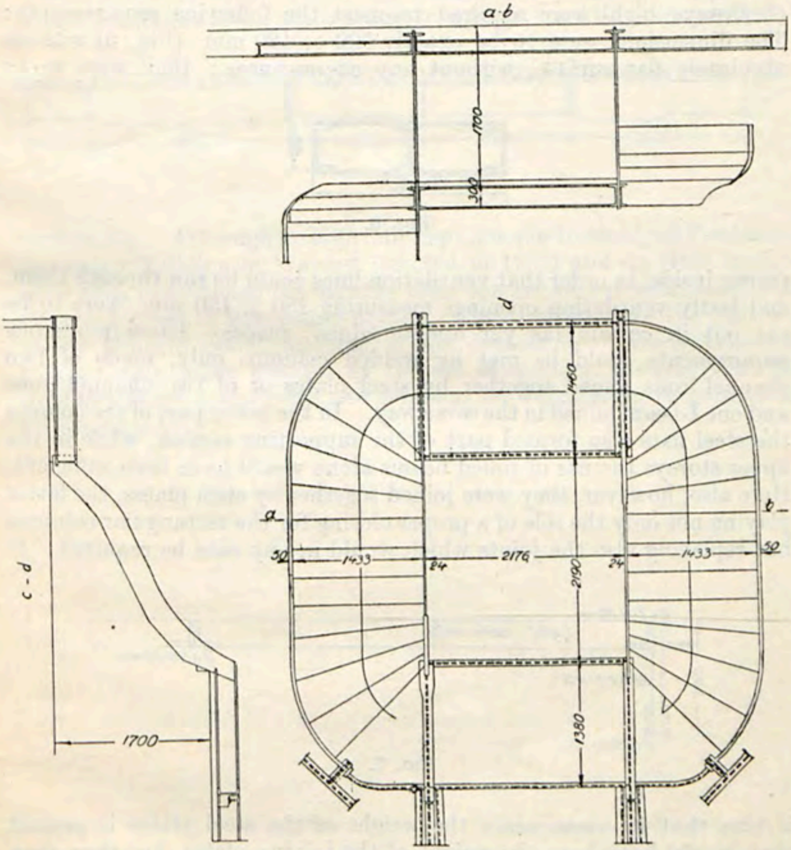

FIG. 5.

tural design. Of these beams one (the inside one) is straight, while the other (the outside one) is curved. Both are composed of three steel flats of the following thicknesses: The inside beam, 7 + 10 + 7 mm.; the outside one, 20 + 10 + 20 mm. These flat plates must be properly cut off and joined by slot welds. The proper cutting off and bending of the plates being most difficult to carry out, it was decided not to cut them according to the drawing but to make special templates. Both beams are joined by means of strong stiffeners. There is a small glazed roof, 8·90 × 8·90 m., with cut angles over the staircase. The shape of the plan was therefore made octagonal. The weight of the construction is about 230 tons.

The third-mentioned building, the depository of the Jagellonian Library of Cracow, has another shape. The columns of this building (7 storeys high) were required to meet the following requirements: The dimensions were to be exactly 500 × 120 mm. (Fig. 6) with an absolutely flat surface, without any excrescences; they were to be

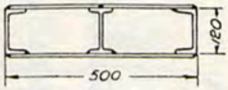

Fig. 6.

empty inside, in order that ventilation lines could be run through them, and lastly ventilation openings measuring 150 × 150 mm. were to be cut out in certain (as yet undetermined) places. These numerous requirements could be met by welded columns only, made of two channel irons joined together by steel plates or of two channel irons and one **I**-beam joined in the same way. In the lower part of the column the steel flats also formed part of the supporting section, while in the upper storeys the use of rolled beams alone would have been sufficient. Here also, however, they were joined together by steel plates, the latter playing not only the rôle of a proper closing for the rectangular columns but replacing also the joints which would in any case be required. It

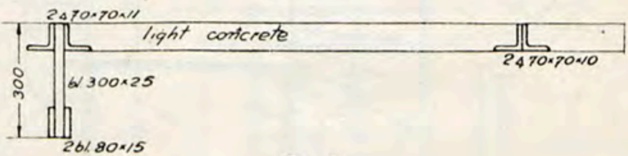

Fig. 7.

is true that in consequence the weight of the steel plates is greater than would have been the weight of the joining plates, but then they accomplish a threefold task. The main ribs forming part of the bookshelves are also of steel plate to which flats are welded; as to the other beams, connecting the pillars, they are made of two angle irons each, disposed and welded in such a way as to allow the concrete plates of the floor to rest upon them (Fig. 7). The weight of the entire construction is about 400 tons.

Among other welded constructions, mention must be made of the foot-bridge in Gdynia, constructed as a continuous parallel truss girder 3 m. high (Fig. 8). The bridge has four spans, of 38, 26, 82, and 34 m. The bridge rests on columns at the end of which there are stairs leading to the bridge. The total weight of the construction is 65 tons.

It may be seen from this short account that welded constructions in Poland have made new progress in 1934. There has not been space to mention steel skeleton buildings being constructed in Poland now, in which welding is being used, either to a large extent or—more often—

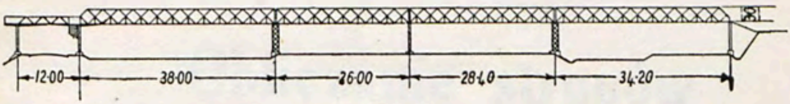

Fig. 8.

exclusively. Although no high buildings like the 16-storeyed Prudential Insurance Building in Warsaw (erected in 1932) and no large bridges have been constructed during this year, the structures mentioned here present a series of interesting details. Constructions like the staircase of the Military Navy Building or the depository of the Jagellonian Library were made possible by the aid of welding, showing that the welding system opens quite new horizons for engineering constructions on a large scale.