

## PATENT SPECIFICATION

384.191

Convention Date (France): July 17, 1931.

Application Date (in United Kingdom): May 23, 1932. No. 14,620/32.

Complete Accepted: Dec. 1, 1932.

## COMPLETE SPECIFICATION.



### Improvements in Building Elements, more particularly for Use in Assembling Constructional Appliances.

I, MARC AURELE ALFRED FAY, a citizen of the French Republic, of 1, Avenue de Beauval, Garches, Seine-et-Oise, France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to building elements more particularly for use in assembling constructional appliances composed of plates of metal or other material having geometrical forms, the said plates being plane, solid or perforated or presenting transversely a regular curvature of variable radii.

The plane plates present on each of the edges bounding their geometrical form curved parts forming knuckle or hinge members all of the same length and transverse section projecting on one or the other face of the plate or alternately inclined in relation to one or other face. These knuckles or hinge members placed in line or offset are disposed between gaps having a width of dimensions a little greater than the rolled parts. These knuckles serve as cylindrical seatings for straight spindles or pins or straight members bent at right angles, or acute angles or obtuse angles, the said spindles being adapted to serve for the attachment of two adjacent plates, the said plates being capable of turning easily about these straight pins so as to assume any desired position for the erection of the various figures.

The interrupted knuckles formed on each of the edges of the plates occupy different positions on the two engaging edges of the plates and their width and the gaps between them are calculated so that all the plates whatever their form fit on all their edges by suitably arranging the plates with the knuckles pointing either in one direction or the other.

The curved plates have interrupted knuckles only on their non-consecutive edges; thus in the case of curved, rectangular or square plates the two opposite parallel edges are provided with interrupted knuckles, the gaps between the knuckles on the one edge being filled by

the knuckles on the opposite edge.

Some plane plates may have a diagonal line of knuckles or a median line of knuckles serving for the fitting of a diagonal or median hinge pin permitting of folding over one another the two equal parts of the same plate, the latter comprising nevertheless knuckles on each of its edges.

The plates may be solid or cut away, the cut away parts having variable forms if desired in order to give the illusion of windows or dormers or decorated panels. The parts cut away may also be covered by placing on the plates strips of paper, or other transparent or translucent material which may be coloured or not in various colours.

The plates may be formed of metal or metallic alloys provided or not with a coating or covered in colour or with paint or enamel, more particularly with a paint on which it is possible to write and rub out easily in order to make lines facilitating the erection of a definite construction by the systematic grouping of plates of different form. The plates may also be of non-metallic material.

The grouping of these plates will serve for the erection of regular and irregular geometric volumes such as tetrahedrons, cubes, parallelepipeds etc., for their development on a plane, for the tracing of shadows of these solids on horizontal, vertical or oblique planes, and in general for the rapid construction of models of solids of very varied forms for perspective drawing.

These geometrical plane plates of varied form will serve also by proper assemblage to construct miniature houses, castles, churches, fortifications, straight and spiral staircases, the cut away parts giving the illusion of dormer windows, glasses, glass windows, battlements, loopholes. Moreover the arrangement at suitable points of the connection of the plates will permit of making doors and windows capable of opening and closing. Moreover by assembling the plates with hinges offset on their edges with others it will be possible to make a partition, or a connection of the plates

[Pri

with one another.

These plane geometrical plates assembled with curved plates will serve to make toy bridges, wagons, automobiles, aeroplanes, boats, furniture and articulated objects of different form.

The accompanying drawings illustrate several plates of geometrical form, plane or curved, provided with knuckles on their edges which are used for erecting purposes and some examples of solids or buildings formed by systematic connection with a certain number of plates.

Figs. 1—6 show in plan some of the geometrical plane plates.

Fig. 7 shows in profile a curved rectangular plate provided on two of its parallel sides with knuckles to receive the spindles serving to connect the adjacent plane or curved plates.

Fig. 8 is a detail view of an angular hinge pin having a right angle, the external apex of the angle being grooved to permit the passage of the straight spindle (shown in dotted lines) serving to connect two adjacent plates.

Figs. 9—13 show the development in a plane of plates of variable form serving for the construction of polyhedral solids such as those shown in Figs. 14—17.

Figs. 14—17 show in perspective some examples of polyhedrons obtained by connecting triangular and square plates as shown in Figs. 1 and 2.

Fig. 18 shows in perspective a section of a spiral staircase constructed with triangular and rectangular plates such as shown in Figs. 2 and 3.

Fig. 19 shows in perspective a church constructed with solid or perforated plates such as shown in Figs. 1—5.

Figs. 20—21 show further details.

As shown in Figs. 1—6 each triangular, square or rectangular plate (1) is provided on each of its rectilinear edges with parts 2 folded at right angles to the plane (1) of the plate to form cylindrical knuckles. These parts 2 are separated from one another by a gap 3 and the gap 3 has a width slightly greater than the rolled part 2 forming the knuckle. The knuckles 2 and gaps 3 occupy on the edges of the plate positions such that all the edges of a plate of the same length whatever its form may adapt themselves to all the edges of the same length of a plate even of different form by disposing the knuckles either inwards or outwards of the plate. The plate (1) whatever its form may be solid as shown in Figs. 2 and 4, or may be perforated, i.e. may be provided with rectangular or square or round openings 4 with or without pressed-out angles or with intersecting openings 5 (see Fig. 1) or with square or rectangular

cut away parts 6 of different size and position as shown in Fig. 3. On the front of these openings there may be pasted, fixed or otherwise attached sheets of paper, cloth or other opaque, transparent or translucent material of different colour.

As shown in Fig. 5 the rectangular plate may be divided diagonally into two parts 7 and 8 by a diagonal line. Knuckles 9 are thus formed at right angles to the plane of the plate on each of these parts so that the knuckles of the one fit within gaps between the knuckles of the other and the connection of these two parts 7 and 8 of the plate is effected by means of a hinge pin 10 passing through the knuckles 9. By means of this hinge pin it is possible to incline the two parts 7 and 8 with respect to one another so as to form between them a variable angle.

A rectangular plate could even be divided into equal or unequal portions on a line parallel to one of the long or short edges of the plate and assembled by means of a series of knuckles such as 9 disposed parallel to one of the edges of the plate. A pin located in these knuckles permits of disposing the two sections of the rectangular plate at a suitable angle to one another.

With a partly circular plate 11 the knuckles 2 are formed on the rectilinear edges of the plate as shown in Fig. 6.

With a rectangular curved plate 12 (Fig. 7) the knuckles 2 are on the opposite edges of this plate.

The pins serving to assemble the plates are usually straight and of a length dependent on the number and size of the plates to be assembled. If the plates are to be grouped at a right angle, acute or obtuse angle there are moreover used in addition to straight pins, pins bent at an angle such as shown in Fig. 8. The pin thus presents two cylindrical parts 13 and 14 forming between them a right or other angle, the external apex of the angle is grooved and forms a recess 15 so that there may be slid down it a pin 16 of a size corresponding to the knuckles 2 formed on the edge of the plates (1).

Fig. 9 shows the development on a plane of triangular plates necessary to construct a tetrahedron such as shown in perspective in Fig. 14.

Fig. 10 shows the development on a plane of square plates necessary to form a cube shown in perspective in Fig. 15.

Fig. 11 shows the development on a plane of triangular and square plates necessary to construct the cube with di-hedral projecting parts shown in perspective in Fig. 16.

Fig. 12 shows the development on a

plane of triangular plates permitting of constructing a solid in the form of a star having eight triangular points as shown in perspective in Fig. 17.

5 In erecting polyhedrons shown in Figs. 14-17 the plane plates are assembled by sliding straight hinge pins into the knuckles *e* formed on the edges of the plates after the knuckles of one edge have  
10 been placed in the gaps of the edge of the adjacent plate.

Fig. 18 shows in perspective a section of a spiral staircase comprising triangular treads *M* and rectangular risers *C*. The  
15 assembling of the rectangular and triangular plates is effected on the one hand by means of straight hinge pins such as those 20 following the notch-board of the staircase and those 21 following the horizontal lines indicating the horizontal edges of the treads, and on the other hand  
20 by means of angular pins 22 such as shown in Fig. 8 assembling at right angles the tread *M* with the riser *C*.

25 Fig. 19 shows in perspective a church constructed of square and triangular plates, some solid and some perforated. The doors *P* are formed by using rectangular plates divided in width into two  
30 equal, symmetrical parts disposed in relation to a median straight pin. After these rectangular half plates have been assembled with the adjacent plates by means of ordinary straight hinge pins, the  
35 median pin connecting the two connected portions of the plate is removed and these portions pivot about pins located in the knuckles on the edges thus filling the part of panels of a door. The roofing of the  
40 church is formed by assembling so many triangular plates and so many square or rectangular plates.

Fig. 20 shows in front view and in  
45 profile a square plate (1) presenting on each of its edges knuckles or hinge portions 2*a*, 2*b* alternately offset slightly to the right and left of the plane of the plate (1). These knuckles have been  
50 formed by cutting away the edge of the plate at one part of its length at right angles to the edge and by rolling around it the part cut out.

Fig. 21 shows in profile the assembling by pins of a plate with offset hinges with plates having spaced hinges of the type  
55 shown in Figs. 1-4.

It should be understood that rigid plates of geometrical form provided on their edges with knuckles or hinges projecting on one or other face of the plate  
60 or offset alternately to right and left of the plane of the plate may be constructed in all sizes for the erection of readily detachable constructions of toys.

Having now particularly described and  
65 ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

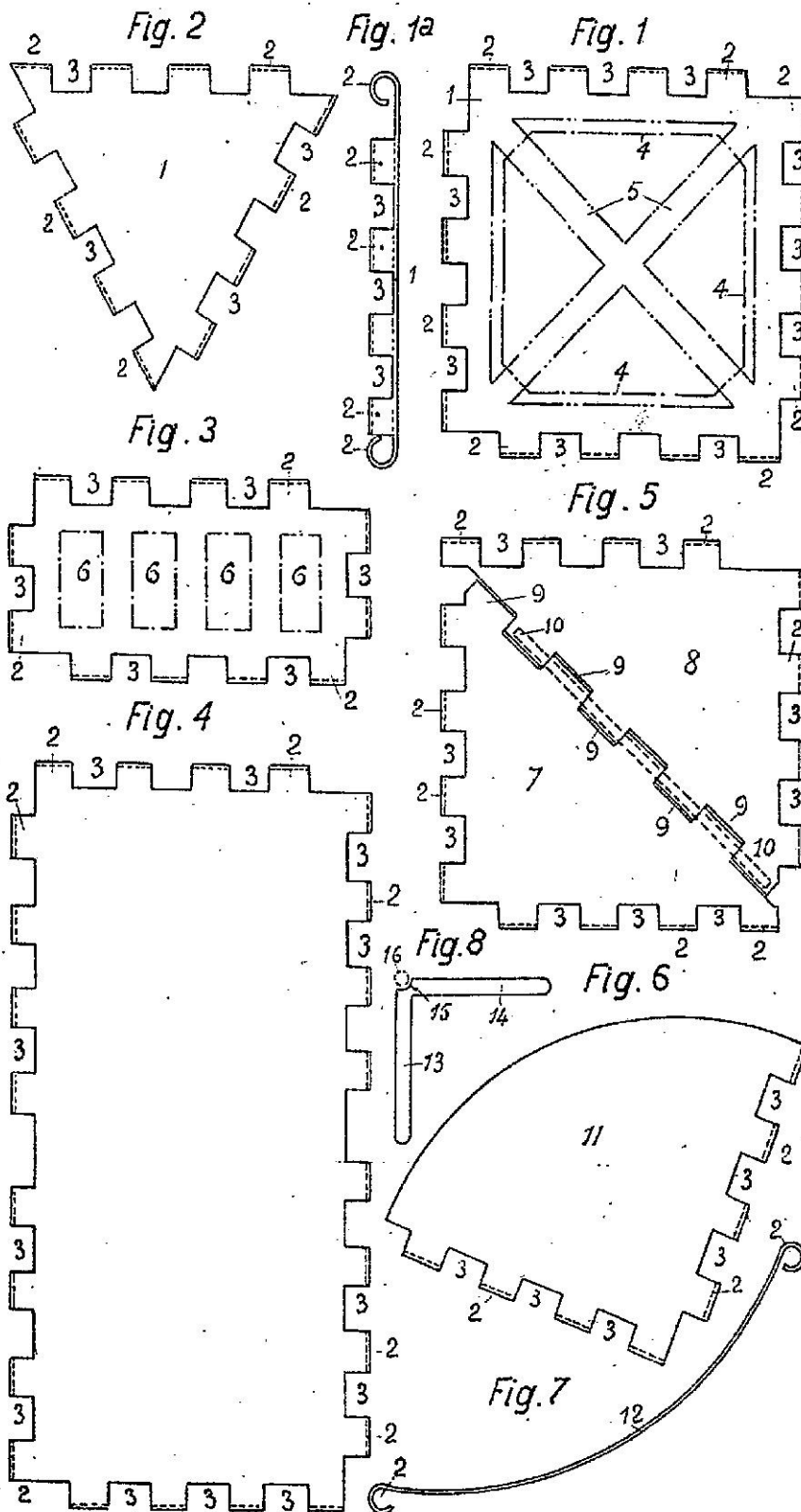
1. Building elements consisting of plane  
70 or curved metal or other plates each provided at two or more of its edges with a plurality of knuckles or hinges bent from the plate at equal distances apart so that the plates can be joined together by means  
75 of hinge pins while the knuckles or hinges of one plate fit in the gaps between the knuckles or hinges of the adjacent plate, characterised by this that the knuckles or hinges are bent out of the plate sur-  
80 faces so far that all the knuckles of one edge lie entirely above the one side of the plate.

2. Building elements as claimed in  
85 claim 1 characterised by this that the knuckles or hinges of one edge are bent down alternately towards one and towards the other side of the plate, so that on one and the same edge two rows of  
100 oppositely bent knuckles or hinges are formed and by the bending outwards of the knuckles or hinges of the one row form the gaps in the other row of the knuckles or hinges.

Dated this 23rd day of May, 1932.

CRUIKSHANK & FAIRWEATHER,  
65-66, Chancery Lane, London, W.C.2.

and  
29, Saint Vincent Place, Glasgow,  
Agents for the Applicant.



[This Drawing is a reproduction of the Original on a reduced scale.]

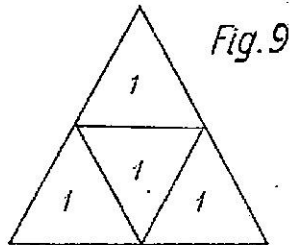


Fig. 9

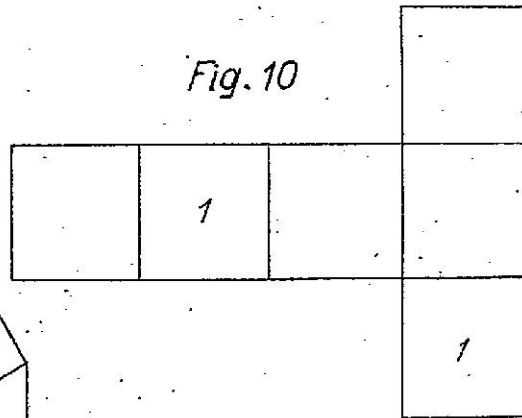


Fig. 10

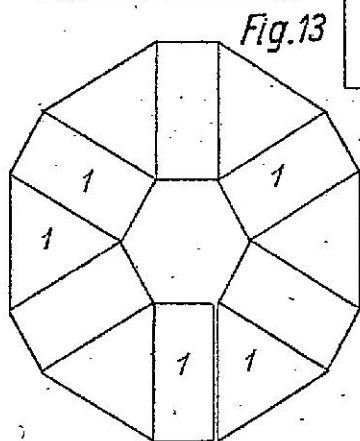


Fig. 13

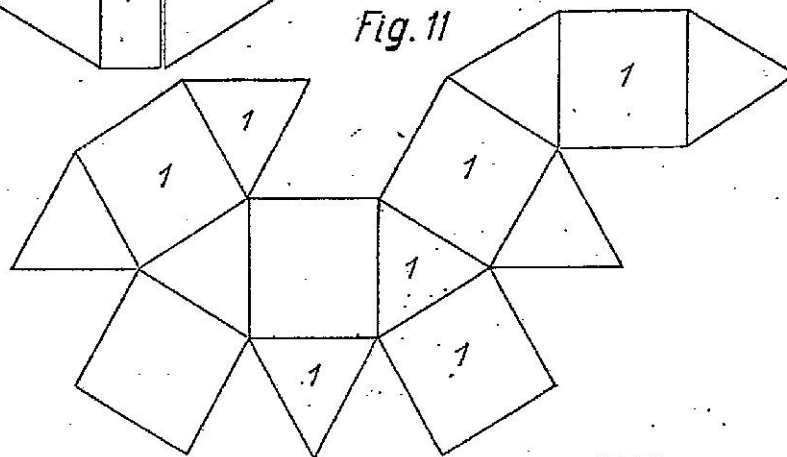


Fig. 11

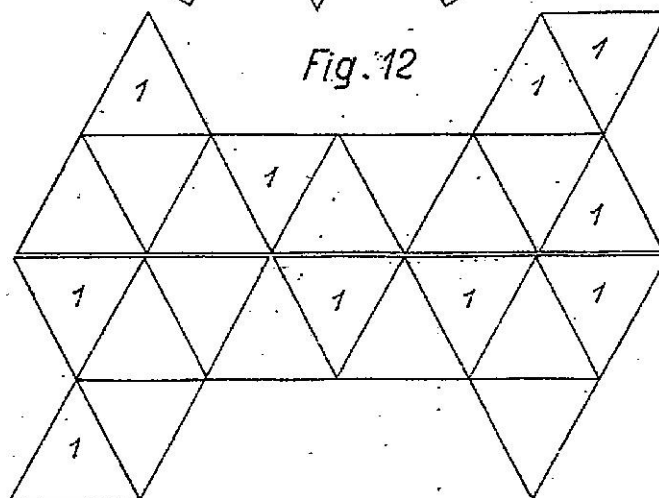
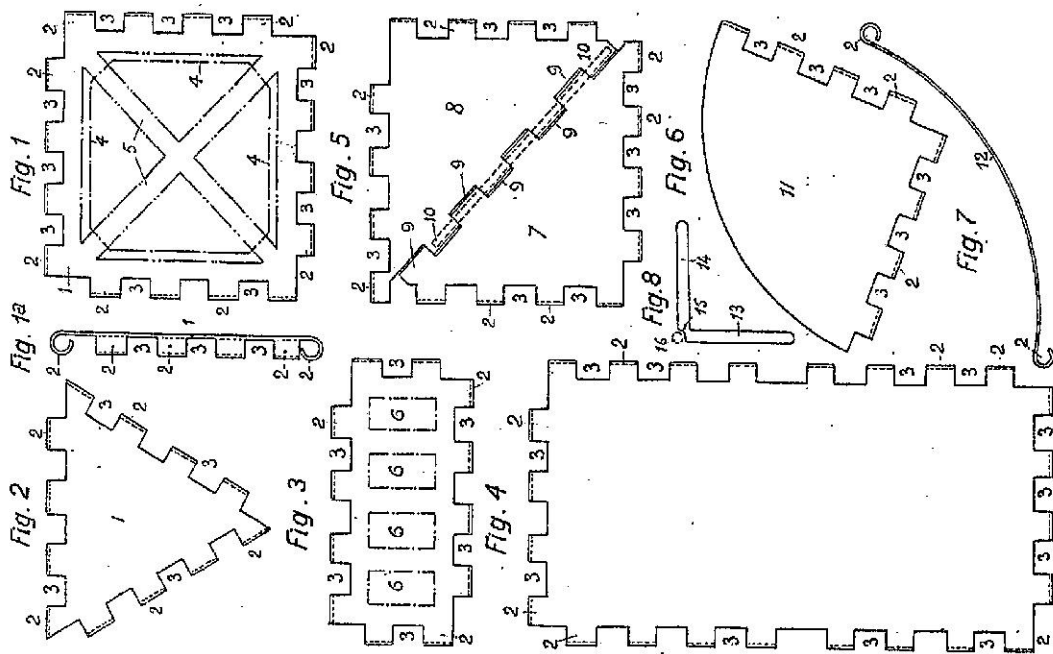


Fig. 12

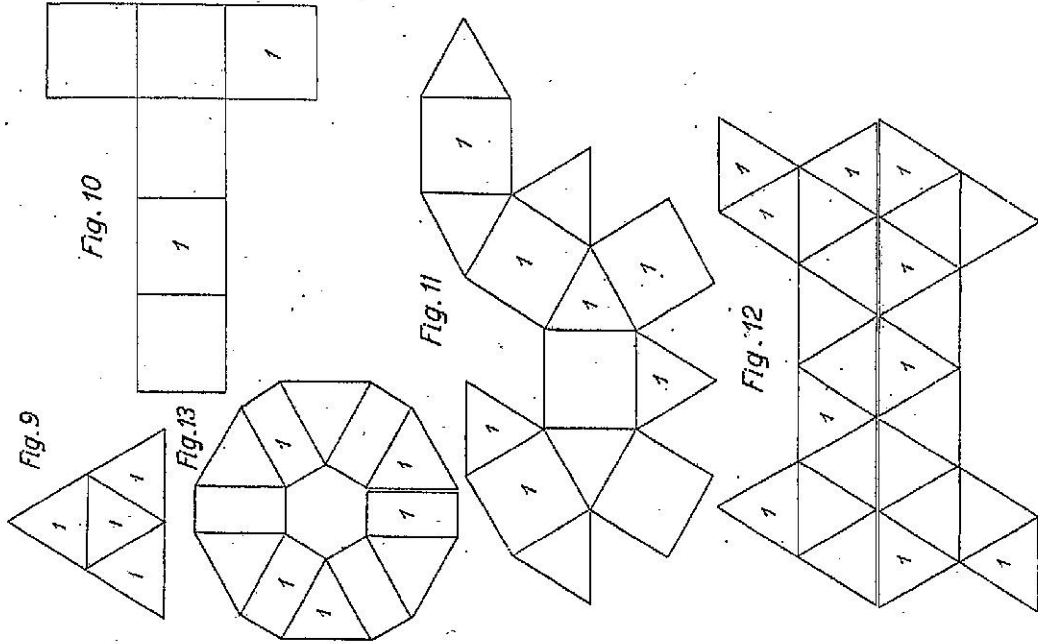
384,191 COMPLETE SPECIFICATION

SHEET 1



[This drawing is a reproduction of the Original on a reduced scale]

4 SHEETS  
SHEET 2



Mealy & Sons, Photo-Litho

Fig. 14

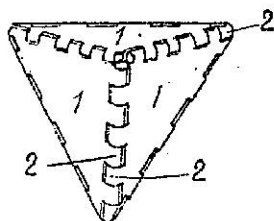


Fig. 18

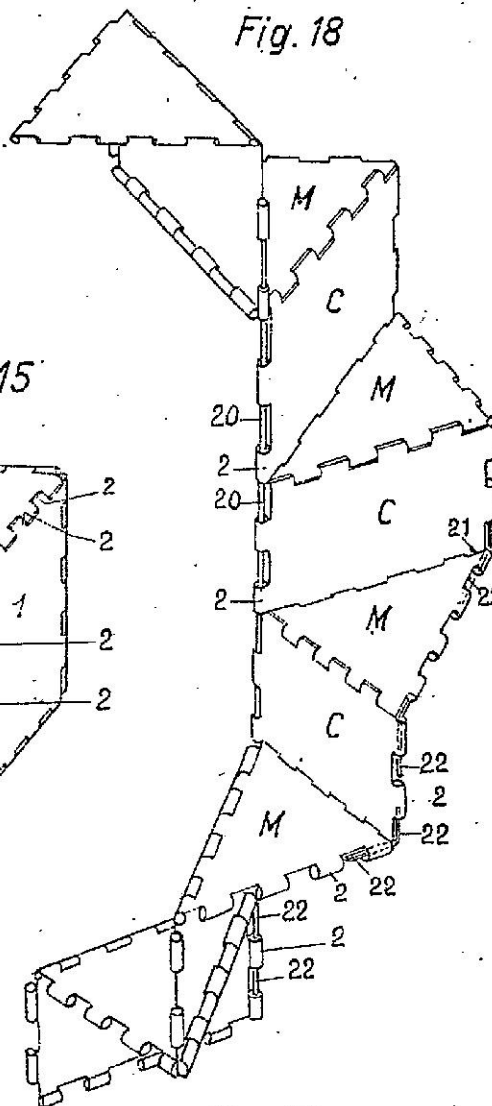


Fig. 15

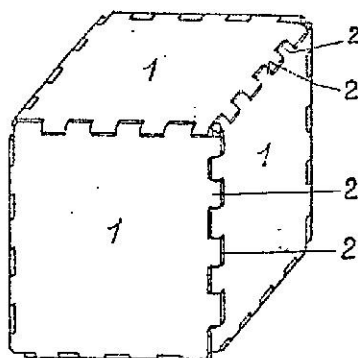


Fig. 16

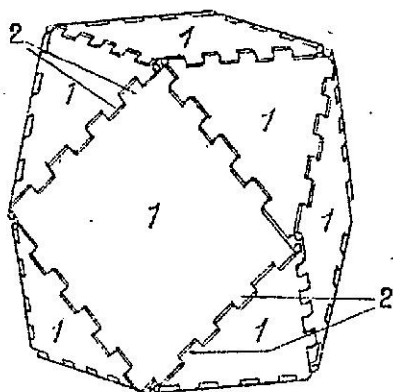
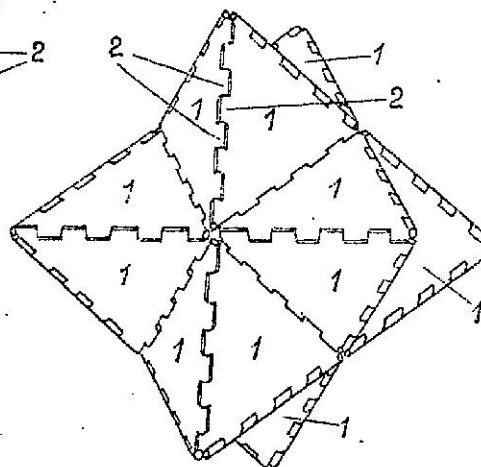


Fig. 17



[This Drawing is a reproduction of the Original on a reduced scale.]



Fig. 19

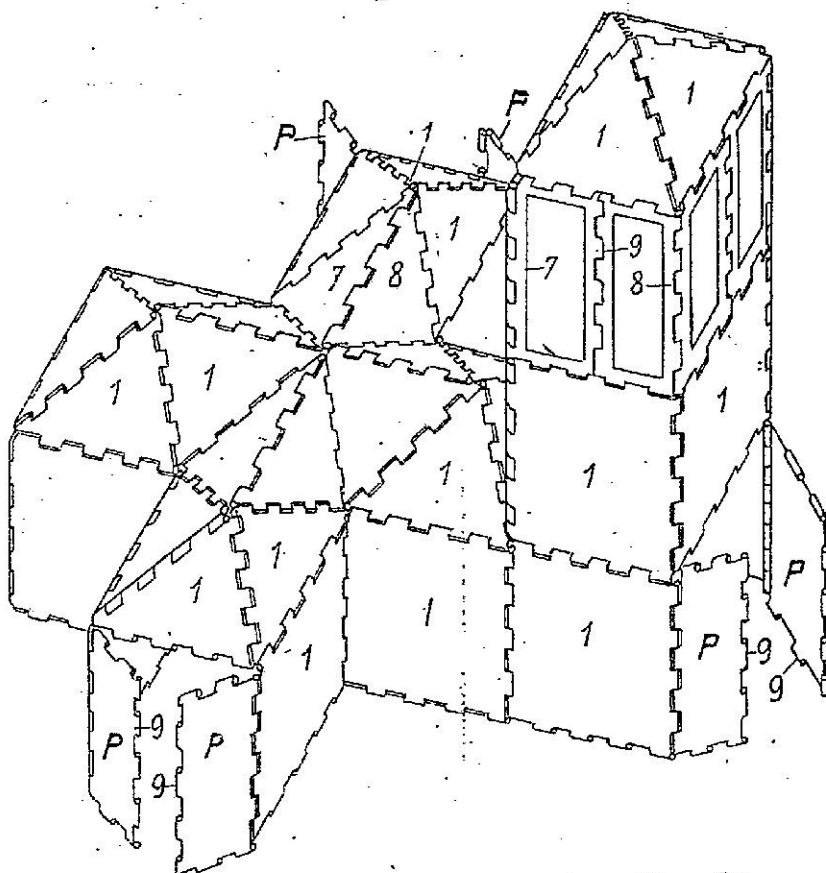


Fig. 21

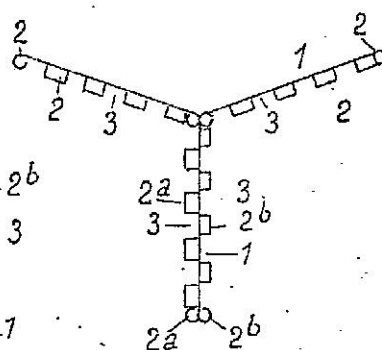
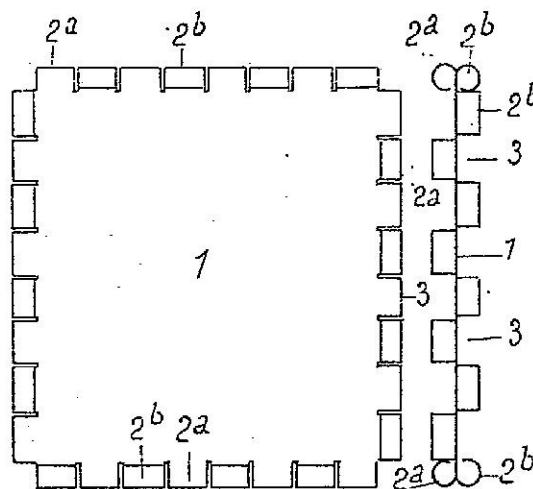


Fig. 20





384,191 COMPLETE SPECIFICATION

SHEET 3

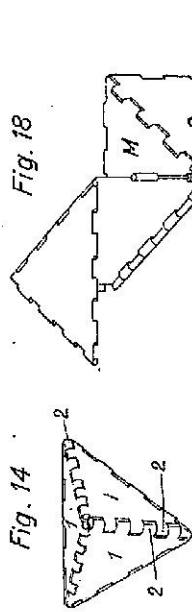


Fig. 14

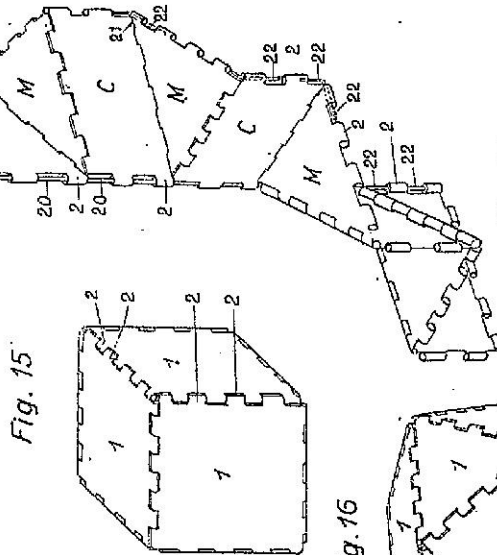


Fig. 15

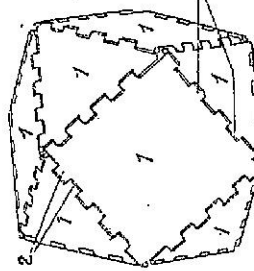


Fig. 16

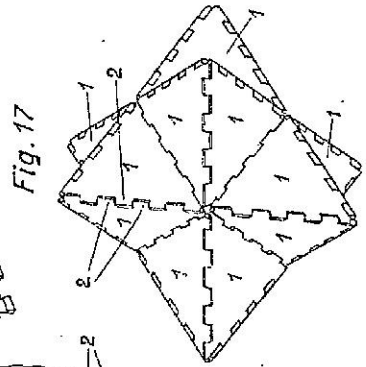


Fig. 17

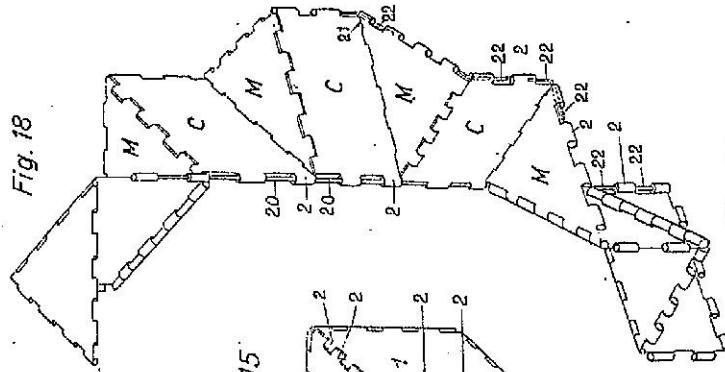


Fig. 18

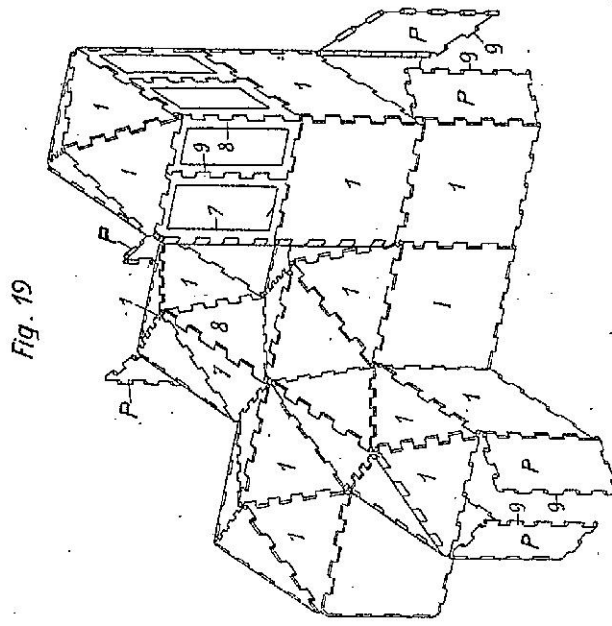


Fig. 19

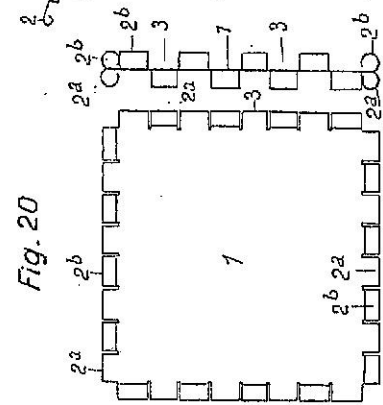


Fig. 20

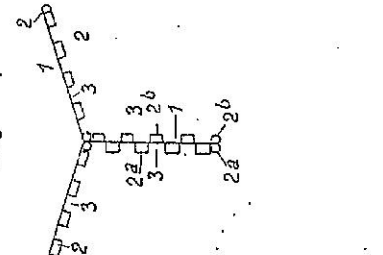


Fig. 21

[This Drawing is a reproduction of the Original on a reduced scale]

4 SHEETS  
SHEET 4

Marty & Sons, Printers Ltd