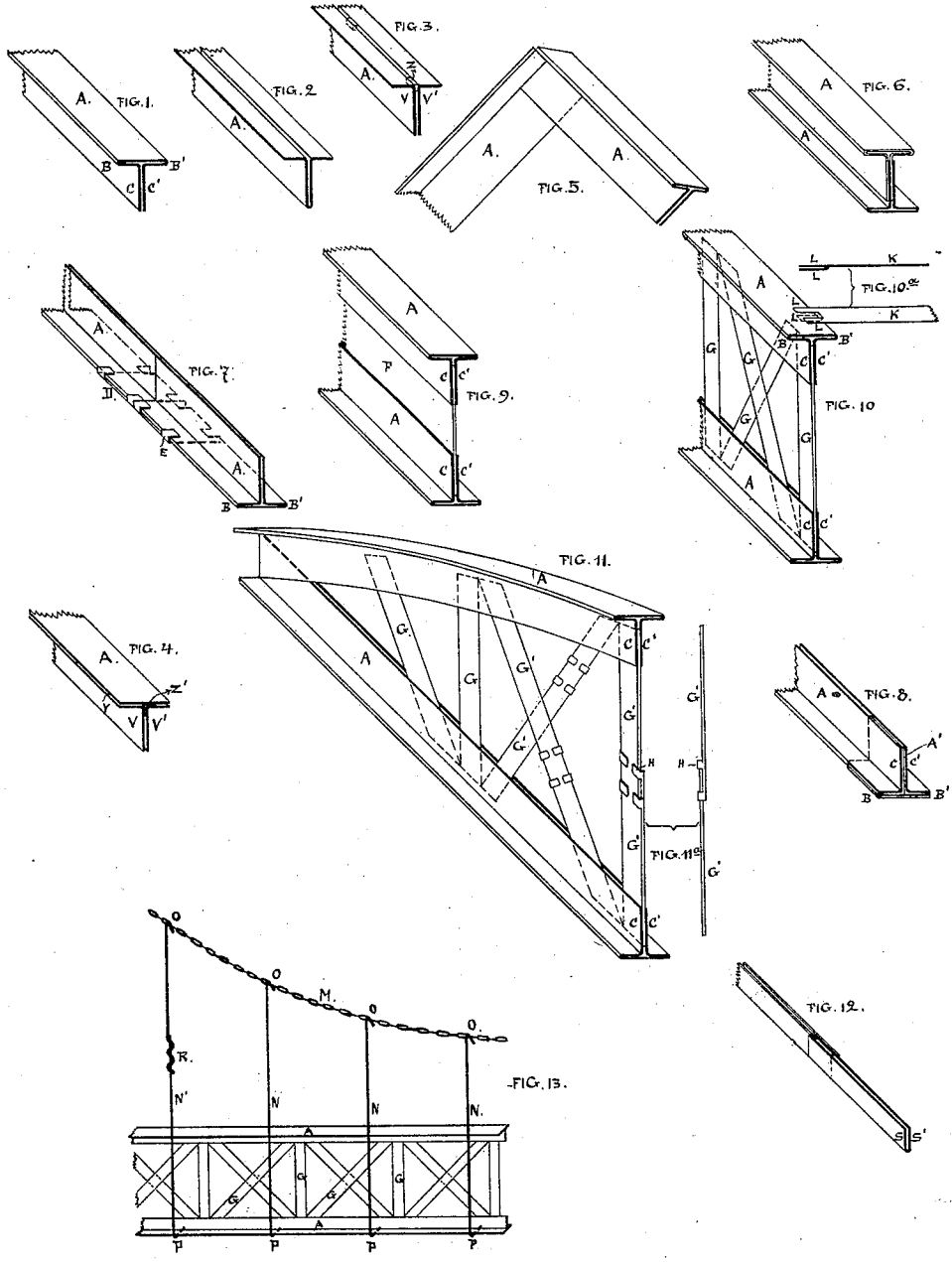
(No Model.) 2 Sheets—Sheet 1.

P. & G. KELLER.

CONSTRUCTIVE APPARATUS.

No. 452,274. Patented May 12, 1891.



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(No Model.) 2 Sheets—Sheet 2.

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CONSTRUCTIVE APPARATUS.

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FIG. 14

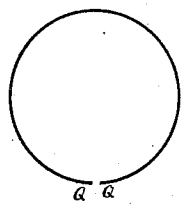


FIG. 14a

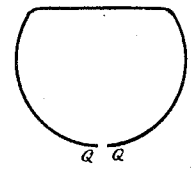


FIG. 15

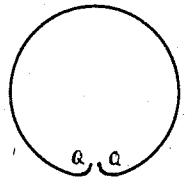


FIG. 15a

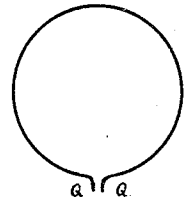


FIG. 15b

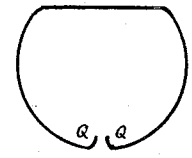


FIG 16

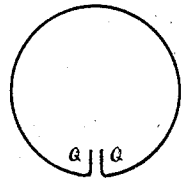


FIG 16a

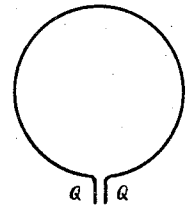


FIG 16b.

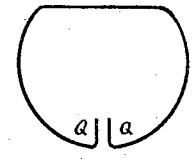


FIG 17

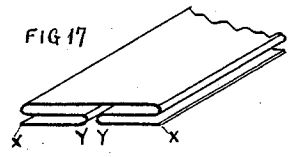
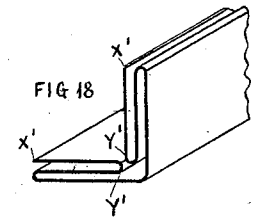


FIG 18



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UNITED STATES PATENT OFFICE.

PAUL KELLER AND GEORGE KELLER, OF RUDOLSTADT, GERMANY.

CONSTRUCTIVE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 452,274, dated May 12, 1891.

Application filed August 6, 1890. Serial No. 361,201. (No model.)

To all whom it may concern:

Be it known that we, PAUL KELLER and GEORGE KELLER, of Rudolstadt, Germany, have invented certain new and useful Improvements in Constructive Apparatus, of which the following is a specification.

Our invention relates to means for building structures, and particularly for instructing youths or adults in the art of building or forming structures of various forms, the said means rendering it possible to make a complete structure either with or without the use of blocks of stone or other material.

Said means consist of peculiar-shaped T-pieces, of simple and adjustable connecting-pieces, of chains, and simple and adjustable wire rods, which by themselves or in combination with stone material enable the erection of any kind of building, such as roof, bridge, viaduct, hall, tower, and any other iron construction.

A, Figures 1 to 11, is the most essential piece for said constructions, consisting of a T-like folded sheet-iron strip of any desired length. The double legs B B′, Fig. 1, are more or less approximate to each other, while the legs C C′ leave a space of about sheet-iron thickness between them, working like a spring and clamping any piece put between them.

Fig. 2 shows the main piece A, Fig. 1, folded in another way. Fig. 3 shows another construction of the main piece A, Fig. 1. Two sheet-iron strips V V′, bent rectangularly, are connected at intervals or throughout the whole length by flat pieces Z. Fig. 4 shows another construction of the main piece A. Two sheet-iron strips V V′, bent rectangularly, are connected at intervals or throughout the whole length by angular pieces Z′. Another strip Y is fastened to one leg of angular piece Z′, thus forming three clamping devices. The characteristic part of all these constructions, Figs. 1 to 4, is the forming of a leg open at least at one side, working like a clamping-spring.

The T's A are furnished in a straight or curved shape, Fig. 11, just as may be desired.

The single T's A, Figs. 1 to 4, are used as beams, pillars, supports, &c.

For roof and like constructions two T's are put together rectangularly, Fig. 5.

To form an I-beam, two T's A are put together like Fig. 6.

In order to couple two or more T's A, the clamps D are used. The laps E grip round the legs B B′ of the T's, Fig. 7.

Another way for coupling two or more T's A is shown in Fig. 8 by shifting one T in the other one. The legs C C′ of T A′ are shifted between the legs C C′ of T A. The other legs B B′ are cut at their closed sides for a desired distance, forming now two parts and working like a fork-like clamp. One part B B′ of T A′ is put between the two fork-like parts B B′ of T A. The other part B B′ of T A′ is put under the lower part B B′ of T A.

Constructions such as sheet-iron beams and like ones are formed by putting iron sheets F of desired width between the open legs C C′, Fig. 9.

Frame-work constructions of a straight, circular, or divergent, &c., shape are formed by putting simple or adjustable strips G G′ between the open legs C C′, Figs. 10, 11, and 13.

The adjustable strips, Fig. 11ª, consisting of two pieces G′ G′ and overlapping each other, are connected by the laps H. Said pieces are lengthened by pulling them out and shortened by compressing them.

To connect T's and other parts at the places B B′, with no clamping device like C C′ at this place, the simple or adjustable iron strips K are used, Fig. 10ª, said strips K being provided with two short cuts at both ends, by which three tongues L L L are formed, the middle one of which being bent out forms with the two outer ones a fork-like clamp.

To erect constructions such as suspension-bridges and like iron buildings, besides all other parts mentioned before, chains M and simple or adjustable wire rods N N′ are used, Fig. 13, said simple rods N being wires of different lengths, having a hook O at one end to engage in the chain M, while the other end P is bent rectangularly, serving as a support for other parts, said adjustable rods N′ forming two pieces, the end R of one being twisted round the end R of the other one like a screw. They are lengthened by pulling them out and shortened by compressing them.

Rods or ties for the construction of roofs and the characteristic American bridges, &c.,

have a sectional shape of a U, Fig. 12. To couple said rods or ties they are cut at the closed part for a short distance, thus forming a fork-like clamp, being put together as shown. Said rods or ties or used in the same way as the T's are, the legs S S′ working again as a clamping-spring.

The suitable form of a tube is shown in Figs. 14 to 16^{b} by bending a sheet in a circular shape, thereby both ends Q Q acting as a clamping-spring. Fig. 14 shows the simplest form of the same. Fig. 14^{a} is flattened on one or both ends of the split tube for the purpose of resting them on walls, girders, &c. Figs. 15 to 16^{b} have suitable bends of the ends Q of the cylindrically-bent sheets, which, according to construction, bend either inside or outside, also acting as clamping-springs.

Fig. 17 shows a flattened double bent sheet, provided with two ends X Y, both serving as clamping-springs.

The legs of the rectangularly-bent piece, Fig. 18, are also provided with a double bend X′ Y′ on each leg, serving as clamping-springs for the reception of certain parts in the erection and construction of bridges, buildings, roofs, &c.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In combination, in a structure, a beam or girder having clamping edges or sides extending longitudinally and forming a channel adapted to receive and hold other portions of the structure, substantially as described.

2. In a structure, a beam having parallel spring sides or edges, with a channel between them extending longitudinally of the beam.

3. In combination with a structure, a beam or girder having clamping edges or sides extending longitudinally and forming a channel to receive other parts of the structure, said beam having an open end forming a socket to receive other parts of the structure, substantially as described.

4. In a structure, a beam or girder having longitudinal clamping-edges arranged parallel and forming a channel to receive other parts of the structure, said beam having a flat side, substantially as described.

5. In a structure, a beam or girder having a series of clamping edges or sides extending longitudinally and forming a series of channels opening in different directions, substantially as described.

6. In a structure, a beam or girder formed of a sheet of material bent or folded and having portions arranged parallel to each other, forming clamping-edges, with a channel between them, substantially as described.

7. In combination, in a structure, the beams having the channels and the adjustable connections G between them.

8. In combination, the beams, the bars K, having the three tongues at the ends embracing the edges of the beams, substantially as described.

9. In combination, in the structure, the beams, the chain, the suspending devices consisting of the wires connected by the twisted part R, substantially as described.

In testimony that we claim the foregoing as our invention we have signed our names, in presence of two witnesses, this 9th day of April, 1890.

PAUL KELLER.
GEORGE KELLER.

Witnesses:
CARL BORNGRAEBER,
KELCHACHOINUTH.