PEASE'S TUBULAR CONSTRUCTION.

Pease's tubular construction is founded on one of those exceedingly simple ideas which appear self-evident as soon as they are seen, and yet are quite novel. The conception on which it is based is that three incomplete tubes, that is, tubes formed by bending strips into a circle, but not welding or otherwise connecting the opposing edges, can be interlocked with one another, so as to make a fairly firm structure. The number of tubes that can be connected in this way is not, however, limited to three. That is the minimum number, and there is no maximum. If, in addition to the stiffness obtained by the interlocking of the tubes, their interiors be filled with concrete, there is produced a structure of very great rigidity, in which the metal tubes supply the tensile strength which the concrete lacks. It is well known that concrete will take such a firm hold of iron as to fully utilize the strength of the latter.

Fig. 1

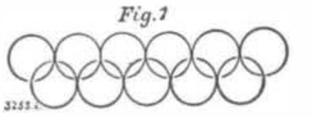
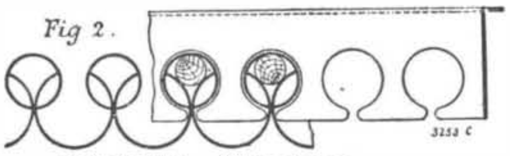


Fig 2.



Longitudinal Section of Bridge Flooring.

Fig. 3.

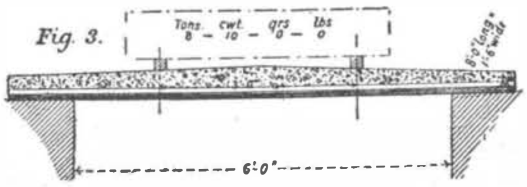


Fig 4.

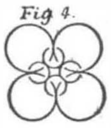


Fig 5

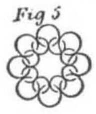


Fig. 6.

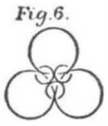


Fig. 7

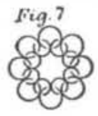


Fig. 8

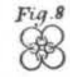


Fig 9

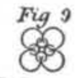


Fig. 10.

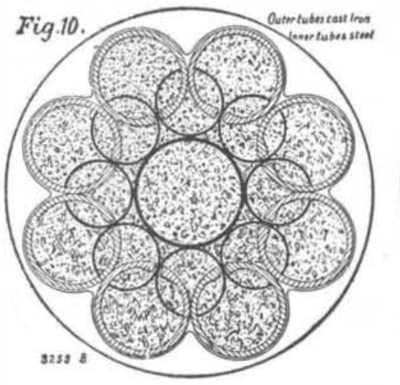
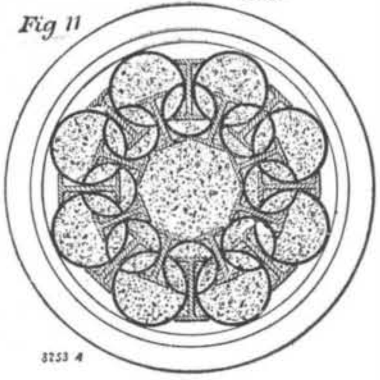


Fig 11



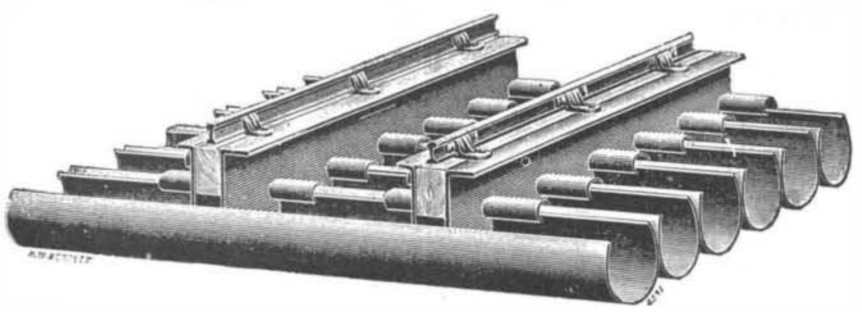


Fig. 12.

PEASE'S TUBULAR CONSTRUCTION.

From time to time we have given reports of the strengthening of concrete slabs by iron bars and wires with most satisfactory results, but in no case have the conditions been so favorable for perfect adhesion as in the construction before us. There are, however, a great many cases in which simple interlocked tubes give ample strength without any kind of filling. For instance, in Fig. 1 is shown a form of construction well adapted to form walls and roofs of temporary buildings, in substitution of corrugated iron. The tubes are of 24 Birmingham wire gage, and 2 inches, 4 inches, 6 inches, or any other diameter. Of course, a wall or roof built in this way is heavier than one of corrugated iron, but it offers considerable advantages, both in hot and cold climates, from its non-conducting qualities. Each tube forms an air cell, while the points of contact between the inner and outer rows of tubes are so small that they do not offer much opportunity for the direct transmission of heat from one to the other. Further, the tubes may readily be filled with moss litter, chaff, sawdust, or other non-conducting material, and thus there will be produced, at small cost, a building that it will be possible to live in with a fair amount of comfort in tropical climates. The same type of construction is adapted both for roof and walls; the former is perfectly watertight, even if laid flat, and all the rain must find its way into the lower row of tubes and run out at their ends.

It is not necessary that the tubes should be all of the same size, and in some cases there may be a saving of material by adopting two different diameters, as shown in Fig. 2. This is marked as a section of bridge flooring, but it also does excellently well for walls or partitions which have to be plastered inside. If the larger tube be almost filled with straw, the quantity of plaster required is reduced, while at the same time a good key is provided. Whatever design of wall be adopted, it has the advantage of perfect portability. As there are neither bolts nor rivets used, a building may be put up and down a score of times without damage to the materials.

Figs. 2 and 12 show a flooring without rivets. It will be seen that it is made of two different sizes of tubes, and that it is further stiffened by wooden keys. The bar with the holes in it is threaded on at an angle to secure further rigidity. A floor of this description is shown under test in Fig. 3. Over the metal there was applied concrete, making the depth 5 inches over all. The span was 6 feet and the width 1 foot 6 inches A load of 8 tons 10 cwt. was applied as shown, giving 19 cwt. per square foot of floor, while the weight of metal was 22 pounds per square yard, or 2·45 pounds per square foot, equal to a plate $\frac{1}{16}$ inch thick. The floor broke down under the load, the iron tearing clean in two. The deflections were as follows: $\frac{1}{16}$ inch with 3½ tons; $\frac{9}{16}$ inch with 6½ tons; and 1½ inch before breaking. In another test made by Messrs. David Kirkaldy & Son, four tubes 3 inches in diameter were joined by three tubes 2 inches in diameter, and were covered with cement to a total thickness of 5⅜ inches. A load was applied at the center over a span of 6 feet, and the ultimate stress was 5,387 pounds. A beam, made of three 4 inch tubes, united by two others of the same size, and all filled with concrete, carried, on a 6 foot span, 6,042 pounds applied at the center before the iron parted from the cement; it failed entirely at 7,822 pounds. In every case the iron was 24 Birmingham wire gage. Figs. 4 to 9 show several kinds of columns built up from tubes according to the methods of Pease's construction. Fig. 4 shows a column composed of four 2 inch tubes and four 1 inch tubes. Filled with concrete, it weighs 16 pounds per foot, and a length of 95½ inches failed under a load of 22,048 pounds.

Fig. 5 comprises eight 1 inch tubes and eight ¾ inch tubes, and weighs 11 pounds to the foot. Its load was 18,080 pounds. Fig. 6 has three 2 inch tubes and the same number of ¾ inch tubes. Its weight is 11·9 pounds per foot, and its crushing load, on a length of 95·5 inches, 17,882 pounds. Fig. 7 has eight outer tubes 1 inch in diameter and eight inner of ¾ inch diameter. It carried a crushing load of 15,864 pounds on a length of 95·8 inches, and failed, as did all the others, by buckling. Fig. 8 is built of 1 inch and of ½ inch tubes, and weighs, filled, 4·6 pounds per foot. Its load, on a length of 72·3 inches, was 11,268 pounds. Fig. 9 is practically the same as Fig. 8. On a length of 46 inches it carried 7,517 pounds.

Figs. 10 and 11 are more ambitious structures. The former is a suggestion for a bridge pier, combining the advantages of cast iron on the outer surface with a steel and concrete core. The latter shows a column in which, in addition to steel tubes, double channels are employed to give greater strength and rigidity.

As regards the simpler forms of this sheet metal tubular construction, it must be conceded that they furnish a new material for which many uses may readily be found. The weight of metal employed is exceedingly small, while the forms in which it is used give it the maximum of strength. Already a boiler chimney has been erected in the form of a reeded column (Fig. 6), with a non-conducting lining, and other uses are being tried almost daily.

We are indebted to London Engineering for the particulars and the engraving.

STOCKER'S CHALK HOLDER.

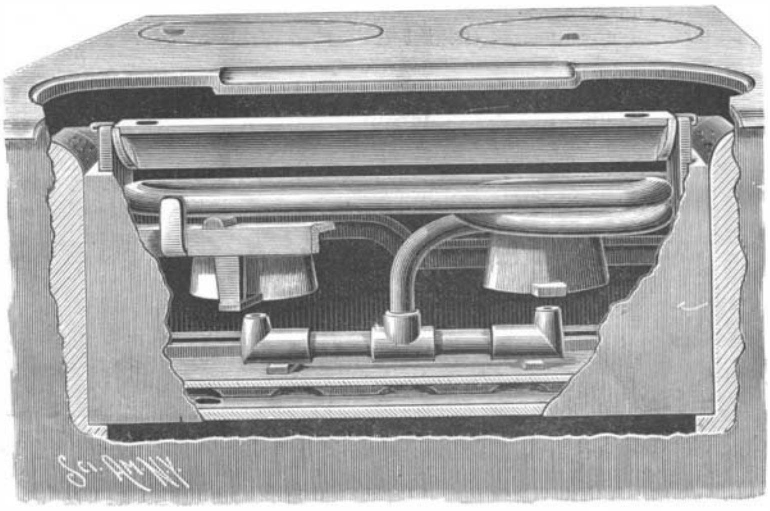
The simple device shown herewith, for conveniently holding a piece of chalk for writing or drawing, has been patented by Albert A. Stocker, of Dixon, Ill. It consists of an open-ended tube, slotted from end to end, a tubular cap fitting over either end of the tube, and there being in the tube a friction slide on which is a pin projecting through the slot. A clamping band of spring metal, as shown also in the small figure, serves to draw the tube or casing into sufficiently firm contact with the chalk.

Locomotive Performances.

The Railroad Gazette recently gave details of a recent trial of compound and simple engines on the Chicago, Milwaukee and St. Paul Railroad. A Baldwin compound stood first. Two compounds beat the simple engines singly and collectively, and the choice of them is only a question of mechanical preference, considering the point of simplicity and durability. The simple engines figure out an average mileage of 28,170 miles per year, and the demonstrated saving of 16·6 per cent would mean about 245 tons of coal saved in a year. At the price of $2 per ton for coal, the saving would amount to $490 for each engine per year.

A GAS GENERATOR AND BURNER.

A device adapted to be placed in the firebox of a stove ordinarily burning wood or coal, and be connected with an oil supply, for generating and burning gas as fuel instead of wood or coal, is shown in the accompanying illustration, and has been patented by Charles R. Clark, of No. 435 State Street, Chicago, Ill. The box or casing is cut away at the rear, that the flame and heat may more readily reach and heat the stove, and the necessary air is admitted through bottom openings. Integral with the ends of the base plate are standards, on which are secured the lugs of a frame, adapted to carry the generating coils and mixing cones. The generating tube, entering at one side near the top, passes entirely around the interior of the box, and then forms a lower coil around one cone, passing thence to a central T at the bottom, provided with gas-emitting nozzles, the burning gas from which is thus directed upwardly into the region of the generating pipe. The frame also supports, immediately above each burner, a mixing cone, adapted to confine the gas and mix therewith the amount of air necessary for its most efficient combustion. Extended upward from the standards at each end are arms forming bearings for the trunnions of a deflector plate whose bottom has a central rib, the surfaces at the sides of which are curved in the arc of a circle, it being intended, by the swinging of this plate, to direct the flame against the oven side, as desired. It is the purpose of the lower coil, around one cone, to superheat the gas before it reaches the burner nozzles, and thus obtain better results from its combustion.



CLARK'S GAS GENERATOR AND BURNER.

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MR. A. S. WALBRIDGE, of Mystic, Canada, has been a subscriber to the SCIENTIFIC AMERICAN for 49 years.