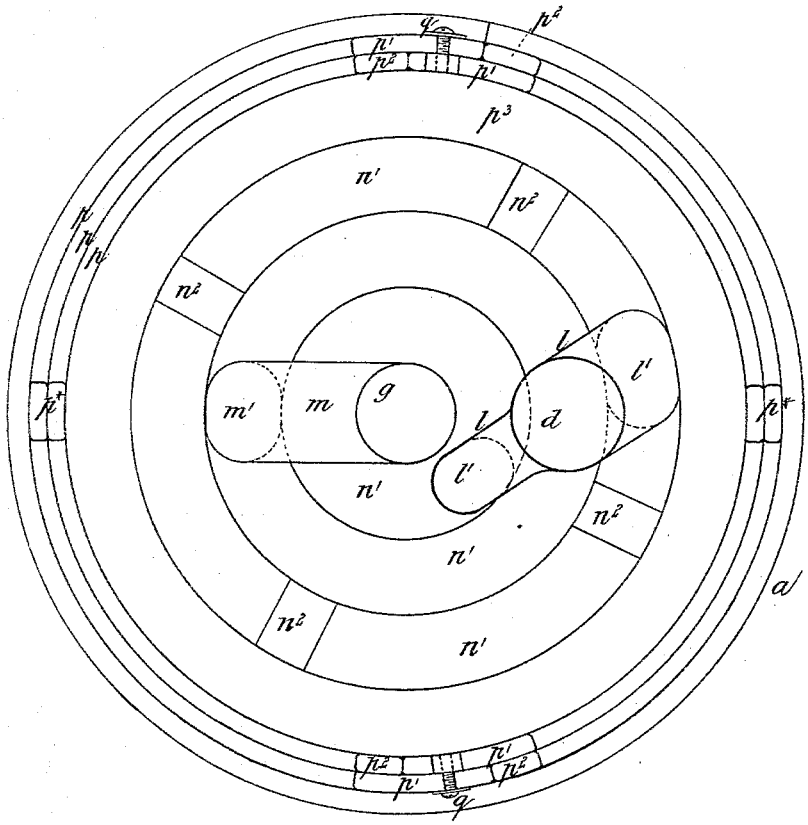
E. MAW.

Heating and Cooling Apparatus.

No. 210,796. **Patented Dec. 10, 1878.**

Fig. 1.



Witnesses:

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Thomas E. Birch.

Inventor.

Edwin Maw

by his attorney

Edwin H. Brown

E. MAW.

Heating and Cooling Apparatus.

No. 210,796. Patented Dec. 10, 1878.

Fig. 2.

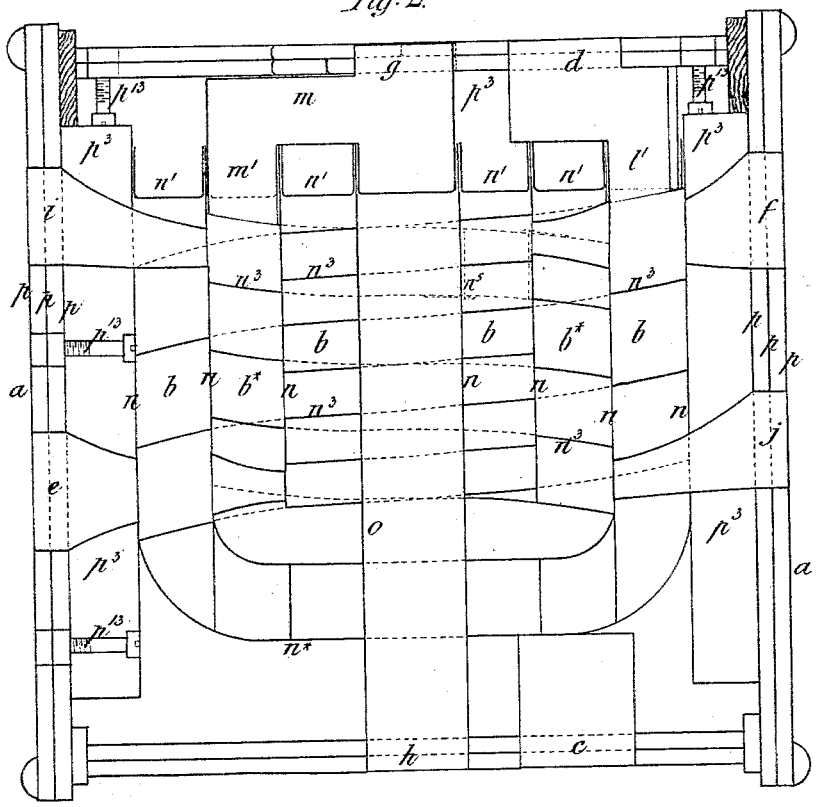
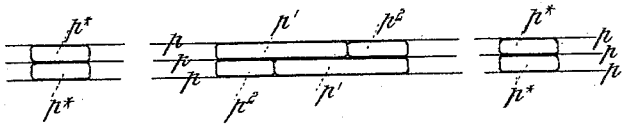


Fig. 8.



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6 Sheets—Sheet 3.

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Fig. 3.

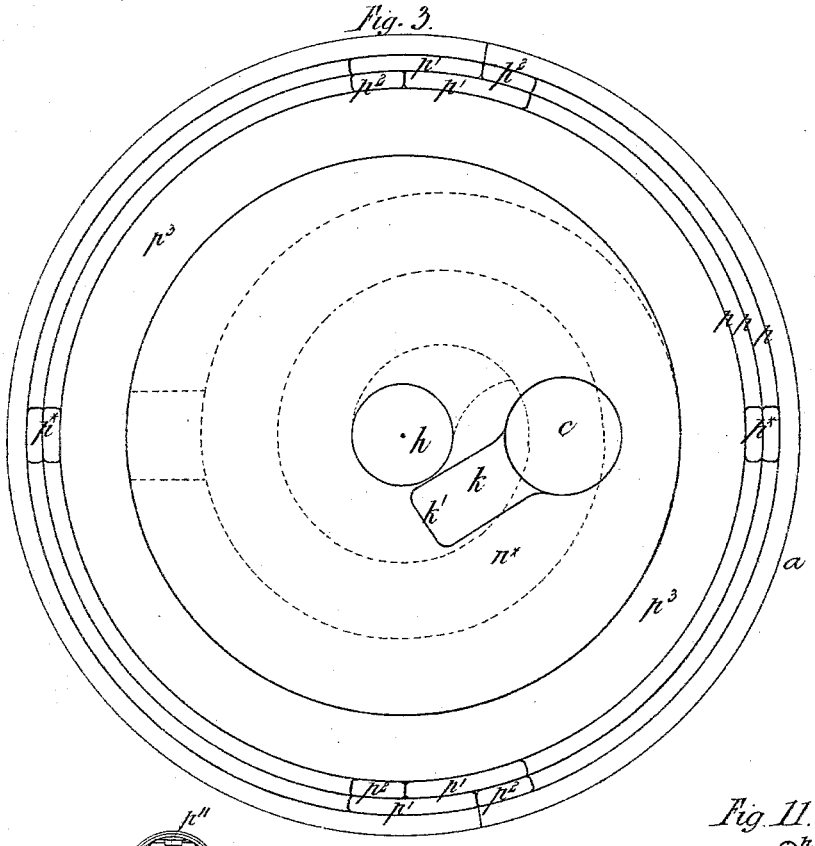

Fig. 9.

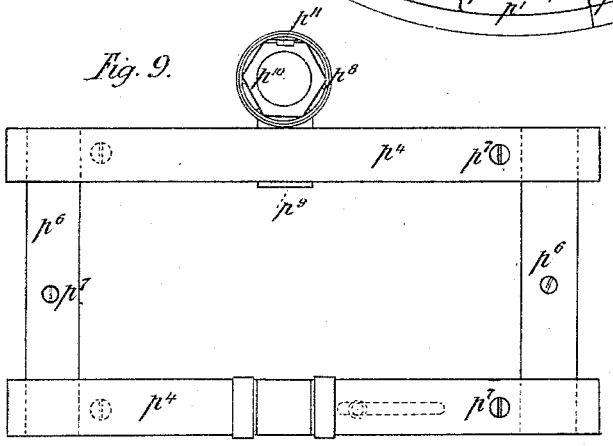

Fig. 10.

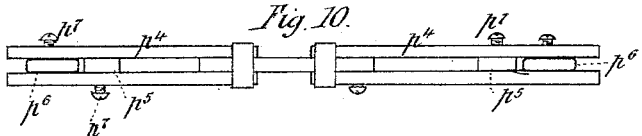

Fig. 11.

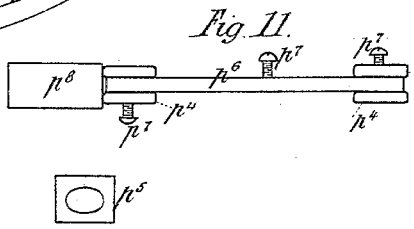

Fig. 12.

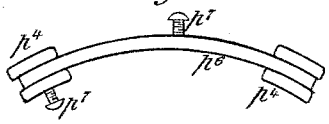

Fig. 9a.

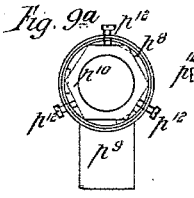

Fig. 9b.

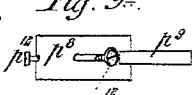

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Fig. 5.

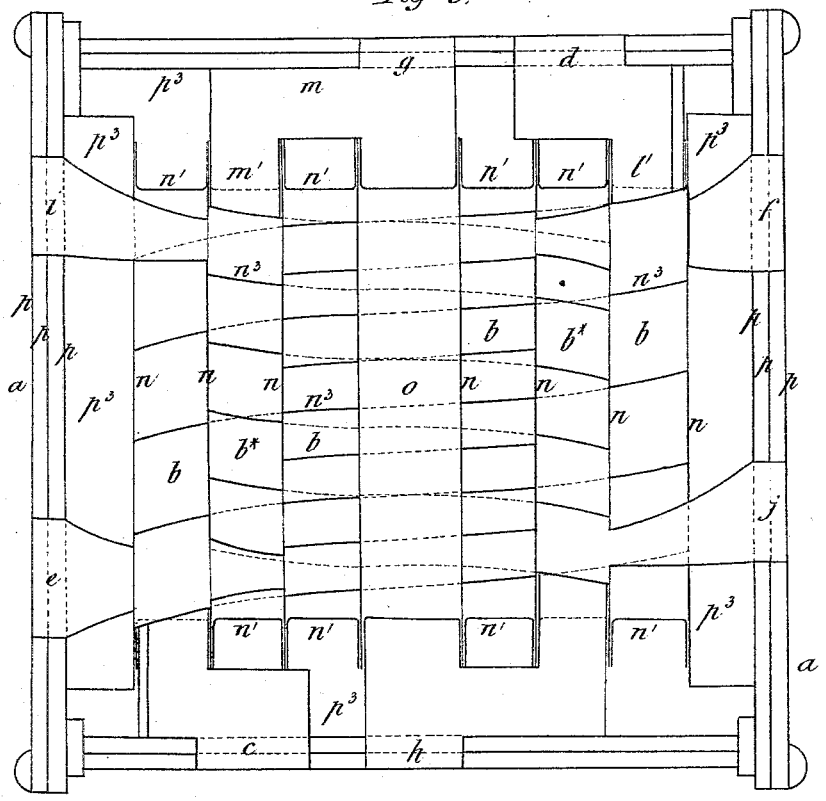

Fig. 16

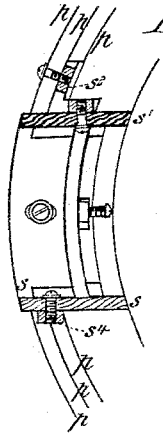

Fig. 18

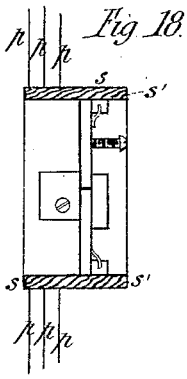

Fig. 17

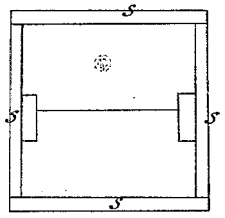

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Fig. 6.

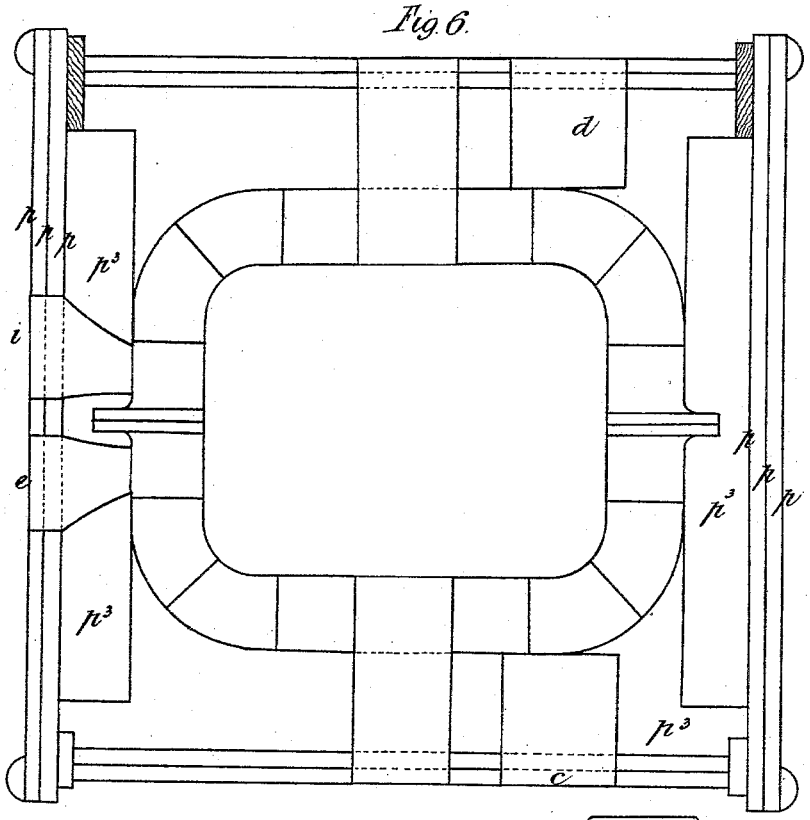

Fig. 4.

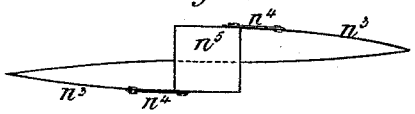

Fig. 19.

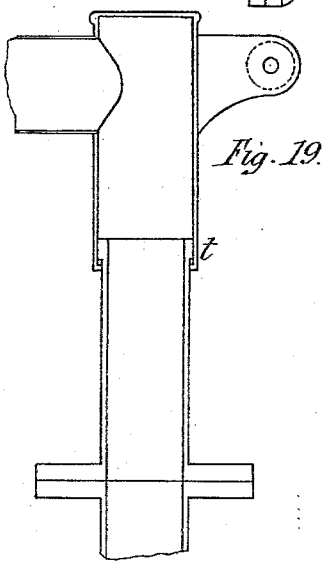

Fig. 13

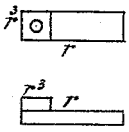

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Fig. 14.

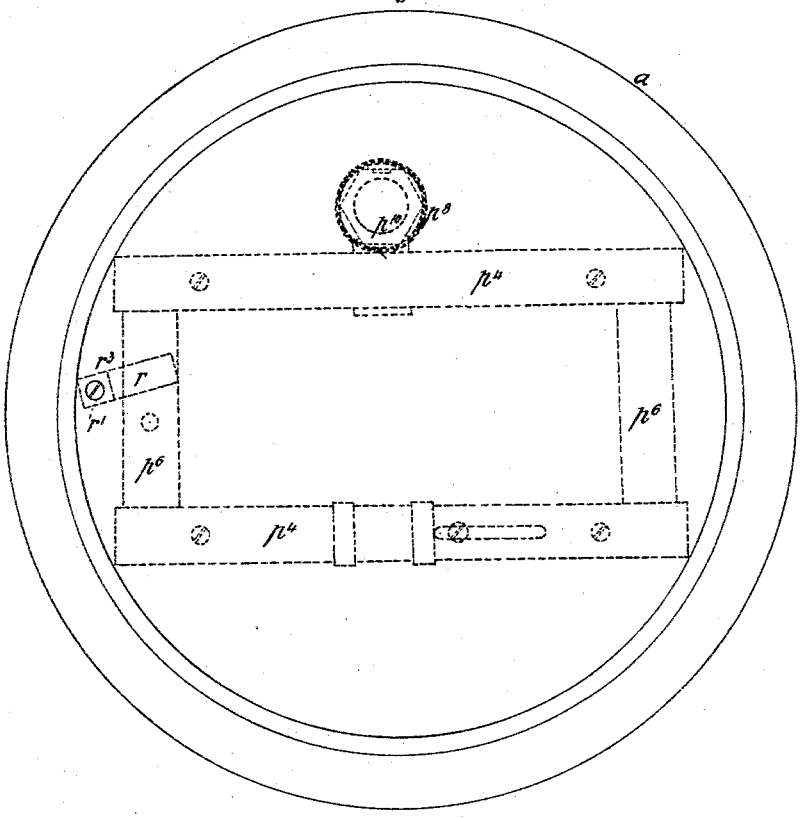


Fig. 15.

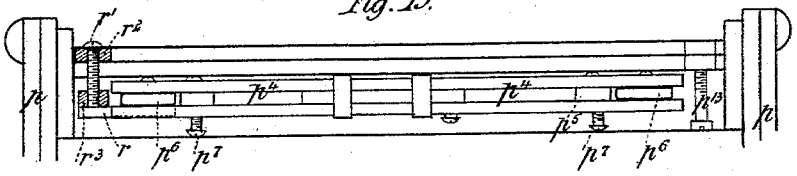
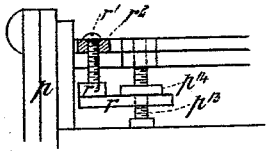


Fig. 9c.



Witnesses:
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Thomas E. Birch.

Inventor.
Edwin Maw
by his attorney
Edwin A Brown

UNITED STATES PATENT OFFICE.

EDWIN MAW, OF LIVERPOOL, ENGLAND.

IMPROVEMENT IN HEATING AND COOLING APPARATUS.

Specification forming part of Letters Patent No. **210,796**, dated December 10, 1878; application filed November 23, 1877.

To all whom it may concern:

Be it known that I, EDWIN MAW, of Liverpool, England, have invented new and useful Improvements in Heating and Cooling with Atmospheric Air, of which the following is a description:

The object of my invention is to produce an effective apparatus for use in imparting heat to and abstracting it from liquids and gases, and one which shall be very compact and protected from extraneous influences.

To this end my invention consists in an apparatus comprising the combination of alternate continuous spiral passages, arranged one outside another, each provided with an inlet and an outlet, certain of said passages being for the air, gas, or liquid to be heated or cooled, and the alternate passages for the agent used to impart or abstract heat to or from said air, gas, or liquid.

It also consists in details of construction to be hereinafter explained.

In the accompanying drawing, Figure 1 is a plan or top view of an apparatus embodying my invention, with the end removed and partly in section. Fig. 2 is a central vertical section thereof. Fig. 3 is an under-side view, with the end removed and partly in section, of a condensing apparatus constructed according to my invention. Fig. 4 is a detail view of what I term "distance-pieces," employed in the apparatus. Figs. 5 and 6 are central vertical sections of modified forms of the apparatus. The other figures illustrate details of construction hereinafter explained.

Similar letters of reference designate corresponding parts in all the figures.

a is the body of the said apparatus. *b b* are spiral passages through which air is circulated. The inner of these passages is provided with an inlet, *c*, at the bottom of said apparatus, and an outlet, *d*, at the top, for the air; but the outer of said passages is provided with an inlet, *e*, for the air, arranged at one side of the apparatus, and an outlet, *f*, therefor, arranged at the opposite side. *b* b** are spiral passages for the reception of steam or other fluid, and arranged between the inner and outer air-passages *b b*. They are provided with a steam-inlet, *g*, at the top of the said apparatus, and a fluid-outlet, *h*, at the bottom of the said apparatus, which is serviceable when the said apparatus is used as an evaporator. They are also provided with a steam-inlet, *i*, at one side of the apparatus, and an outlet, *j*, for steam when there is any to be discharged, as also for the water of condensation. *k* (see Fig. 3) is an air-distributer at the bottom of the said apparatus, and *l* (see Fig. 1) is an air-distributer at the top of the same.

The distributer *k* has a branch, *k'*, with an aperture through the covering-plate *n** of the spiral passages, and the distributer *l* has branches *l' l'*, provided with apertures through the covering-plates n^1. *m* is a steam-distributer, arranged at the top of the apparatus, and provided with a branch, *m'*. *n n* are thin metal cylinders separating the steam and air passages, and n^2 n^2 are strengthening-pieces for the covering-plates n^1. n^3 n^3 are spiral plates, provided in their ends with holes, and furnished with clips n^4, whereby they are united to distance-pieces n^5, (shown detached in Fig. 4,) and serving to connect said plates and regulate their pitch or distance apart.

The apparatus shown in Fig. 5 differs from the former only in being constructed similarly at both the bottom and top, and in having an additional outlet for steam and water of condensation. The end inlets and outlets only are necessary when it is to be employed as a horizontal condenser, superheater, hot-water heater, or blast-heater. When desirable, the central tube *o* may be removed to enlarge the passage for the air.

When the apparatus is designed as a superheater it acts in the same manner as for a condenser, except that hot air is used in the air-passages instead of cold air, and the steam is heated instead of cooled; and when it is used as a water-heater hot air is passed through the air-passages, and water is passed through what have been termed the "steam-passages."

In Fig. 6 the apparatus is adapted for use as an evaporator or vacuum pan with a curved top and bottom. Hot air enters from the bottom at *c*, and leaves at the side aperture *e*, and cold air enters at *d* from the top, and when warmed leaves at the side of the same at *i*.

I will now describe, with reference to Figs. 1, 2, 3, 5, 6, and 8, what I have termed "cavity-casings," or hollow or chambered coverings.

I make them either straight or curved, with outer, inner, and intermediate thin metal plates p, separated by hollow flanged distance-pieces p^1 p^2, the broad ones, p^1, constituting flanges, and together with the narrow or border ones inclosing or forming cavities or chambers. Preferably the plates of the said casings are strengthened by intermediate distance-pieces p^*, and are made in parts or sections for convenience of transport. They may be connected by means of nuts and screws, as at q, Fig. 1, passing through the outer plates and distance-pieces, for the purpose of fastening the said flanges, and with washers under the screw-heads to cover the holes. I may also construct a cavity-casing, as shown at p^3, Figs. 1 and 3, by means of similar hollow distance-pieces, (straight or curved,) part of which may be made in pairs, as shown in Figs. 9, 10, 11, and 12. I connect them by means of a short distance-piece, p^5, and make part of them of a single piece, as at p^6. The double part, p^4, forms a cavity, into which the part p^6 is inserted, thereby serving as a tongue or groove.

By means of screws and nuts p^7 in the said hollow distance-pieces, I regulate the distance between the aforesaid double cavity-casing and the surface of the apparatus or vessel inclosed or protected thereby.

I connect the distance-pieces of the triple cavity to the sides or ends of the apparatus by means of casings p^8, with arms p^9, surrounding the nuts or heads p^{10} of stay or other bolts, for which I use keys p^{11}, Fig. 9, or set-screws p^{12}, Figs. 9^a, 9^b.

The arms p^9 on the casing p^8 may be turned in any direction, the outer part of the casing, to which they are attached, moving on the inner part of the casing, which is secured to the nuts p^{10}, as above described.

In some cases I may form the triple cavity without the said hollow distance-pieces by means of set-screws p^{13}, except a short length for securing the catch r, hereinafter described, and as shown in Fig. 9^c. I connect the said double cavity-casing to the said distance-pieces by means of a catch, r, (shown detached in Fig. 13,) and placed underneath the double cavity-casing. A screw, r^1, is passed through the nut r^2 in the cavity-casing, and works in a nut, r^3, on the said catch, as shown in Figs. 14 and 15.

When an opening is required through the said cavity-casing, or at the end of the same, for air, steam, or water pipes, or for other purposes, it is necessary to inclose or cover the apertures. For this purpose I use rectangular distance-pieces s, as shown in Figs. 16, 17, and 18.

In some cases these distance-pieces have either metal or wood s^1 inside them for filling up the spaces between the double cavity and the surface incased or covered thereby, the said metal or wood abutting against the said surface.

In some cases I connect the said rectangular distance-pieces to a small knee-piece, s^2, Fig. 16, provided with a nut. By means of this nut and a screw the knee-piece is attached to the outer cavity-casing, and by another nut and screw it is attached to the distance-pieces.

In some cases I connect the rectangular distance-pieces to the double cavity-casing by means of a screw and a nut therein, as shown at s^4.

The supply of air, steam, or other fluid to the said apparatus may in some cases be advantageously regulated by means of telescopic pipes t, (shown in Fig. 19,) provided with a cavity-casing, and serving to shut off the supply.

One important advantage arising from the peculiar construction above described is that I provide a very compact apparatus having a very extensive cooling or heating surface, and one protected from extraneous influences.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An apparatus comprising the combination of alternate continuous spiral passages, arranged one outside another, each provided with an inlet and an outlet, certain of said spiral passages being for air, gas, or liquid to be heated or cooled, and the alternate passages for the agent used to impart or abstract heat to or from said air, gas, or liquid, substantially as herein specified.

2. The combination, with an apparatus for the reception of gases, liquids, or solids, of plates p, and distance-pieces p^1 p^2 p^7 between them, substantially as and for the purpose specified.

3. The combination of the distributers k l m with the spiral passages, substantially as and for the purpose specified.

EDWIN MAW.

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London, England.