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Bologna

L'invenzione di Quirico Filopanti:

Warming with hot bullets
(Riscaldarsi con palle di ghisa calde)

Riassunto e trascrizione dal manoscritto
a cura di Pier Gabriele Molari

Il teleriscaldamento
Appunti: Londra post 1858

Filopanti progetta una forma di teleriscaldamento discontinuo mediante la distribuzione "porta a porta" di sfere di ghisa incandescenti ad intervalli regolari di tempo.
Filopanti pensa di utilizzare sfere di ghisa incandescenti (di circa un chilogrammo) per riscaldare le persone nei propri appartamenti, per cuocere cibi, per riscaldare i negozi, per riscaldare la cabine dei veicoli e le carrozze ferroviarie, per riscaldare i luoghi di pubbliche manifestazioni (in questo caso pensa a sfere da 20-30 chilogrammi).
Si tratta di un sistema analogo ai sistemi irradianti che oggi si vedono all'esterno dei caffè quando è freddo. Si tratta di sfere incandescenti di ghisa che, lambite dall'aria, la riscaldano o irradiano energia tramite specchi.
Il sistema è studiato fin nei minimi dettagli, dato che illustra come rivestire queste sfere incandescenti, come ricaricarle e come standardizzarne le dimensioni.
Calcola, senza considerare le perdite, che una sfera fusa in ghisa del peso di circa un chilogrammo (circa di 60 mm di diametro), riscaldata a 1450 °C è sufficiente per riscaldare da 0 a 14,5 °C una stanza di 3,7 x 3 metri alta 3 metri.
Interessante è leggere quanto siano d'attualità i vantaggi che un tale riscaldamento può portare:
riscaldare quando non vi siano impianti di riscaldamento ad un costo bassissimo (calcola "la ricarica" in un farthing, cioè la più piccola suddivisione della moneta corrente) presentare assenza di polvere, di fumo, di emanazioni di gas nocivi.

Nota:

Nella trascrizione viene conservata la divisione del testo nei fogli e nelle righe dell'originale.

Bologna, 21 giugno 2012

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A copy of the provisional specification of Quiricus Filopanti's invention for warming with hot bullets.

My purpose is to bring into usage a cheap and commodious means of calefaction in places and circumstances where warming by the actual combustion of fuel would be impracticable or inconvenient. Iron is one of the least fusible, and endowed with the greatest specific caloric, among all metals. It will endure a temperature of 2186° Farh. before changing its state. The con= sequence is that we can store up a very great quantity of disposable heat in an exceedingly little volume of iron. Let us suppose for an example a small cast iron bullet of only two pounds weight to have been hea= ted to 2632 °F. The specific caloric of cast iron, at high temperatures, is nearly equal to half the specific caloric of air. A pound, therefore, of hot cast iron, by losing two degrees of its temperature can raise by one degree a pound of air. The supposed bullet can consequently raise from 32° to 58 °F fifty pounds of air. This is the weight of a little more than 1200 cubic feet of atmospheric air, namely as much as fill a room 12 feet long, by ten broad, and high.

When the object is only to warm the air of a closed room, the rapi= dity with which incandescent metal tends to cool will rather be advantageous than otherwise: for every unit of heat than is lost by the ball is gained by the air. Generally, however, it will be desirable to retard the process of cooling.

The rapidity of cooling increases in a greater proportion than the difference of tempera= ture between the hot body and the medium, in the direct ratio of the surface, and in the inverse of the mass. For this reason, independently of others, the spherical or bullet form of the heating iron will in most cases be preferable to any other; for of all possible bodies the volume of the sphere bears the greatest ratio to its surface. In many cases it will even be advisable to

surround the hot bullet with an incombustible yet not metallic body, such as burnt clay, for instance, where conductive power is thirty-four times smaller than that of iron. Even where the incandescent bullet is to be used in its naked form; it shall be surrounded with a wire work, to preserve combustible bodies from being injured by its contact. In either case the protec= tive shell should be composed of two distinct hemispherical cavities, which can exactly embrace the bullet when drawn close to it, or let it free, by opening pincers-wise.
I intend proposing or attempting six different applications of this simple device: 1° to warming persons in private apartments; 2° to cooking; 3° to war= ming shops; 4° to ordinary vehicles; 5° to railway carriages; 6° to places of public exhibitions.

The hot bullet may be used advantageously not only in rooms where there is no fire at all, but also where there is one, placing the bullet on the side opposite to the fire, and whence the chilling draft usually comes. In ei= ther case great assistance would be rendered by a tin reflector so shaped and placed as to throw the greatest part of the reflected heat on the seated person. Advantage of the radiating caloric may be taken even in the case of the bullet being protected by a shell of a little conductive substance. If a sector, whose vertical angle is 120°, be left vacant in the shell, by turning the naked iron calotte towards the body or the part of the body parti= cularly requiring to be warmed, it results from the geometric properties of the sphere and from the physic law of the emanated caloric as well as light being proportional to the sine of emission, that the person can enjoy three full fourths of the whole quantity of the radiating heat which he could receive from the whole hemisphere, and yet the loss of heat by the unprotected calotte, being proportionate to its surface, well only be one quarter of the caloric which would be dispersed by the whole unprotected surface of the sphere.

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The bullets could be heated in the house itself, with an ordinary fire and a little chimney bellow, and oven without the latter, though, of course, in more time and to a less glowing degree. If, however, the system should have any prospect of being extensively adopted, it might be found both conducive to the public welfare and profitable as a pecuniary speculation to establish at different places, in cities and towns, shops where the bullets would be hea= ted by a large and proportionally economical apparatus. A number of bullets would be conveyed, we may suppose, with a horse vehicle, along the streets, at regular intervals of time, and from the vehicle each bullet, protected by a thick shell, would be brought up by hand to the customer. The re= ceptacle of the vehicle might properly be of a spheric form, and surroun= ded with a thick coat of little conductive matters. The bullets would be drawn out through a hole in the bottom of the tumbril, the spheric form conferring on them some of the advantages of liquids. It is important that there should be only a few determined sizes, in order that any cold bullet might always be exchanged with a hot one of equal diameter, with no compensation but for the heating and conveying. I think it will be possible to heat and deliver, at the price of one of smallest subdivision of current money, a bullet of sufficient bulk, as to preserve, by the protection of a shell, a considerable heating power during several hours.

For the convenience of poor people the shell may be made of a form calcu= lated to afford the commodity of boiling water and cooking meat. Perhaps it is not impossible that even people in moderately easy circumstances should find it convenient at all seasons to resort to hot bullets supplied from out of doors for the kitchen, or rather dining room, cooking. For I think I am permitted to find less preposterous than amusing the notion of the house-wife cooking, with a nice hot bullet apparatus, the dinner in the middle and on the very cloth of the table where it is to be eaten.

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In public shops, incandescent bullets can be used both for the convenience of shopmen and customers.

In cabs and carriages making short excursions, the hot bullet, properly protected by a wire net on all sides, may be suspended by a small chain from the roof. A few hooks at different points of the chain, and a ring at the end of it, will allow the bullet to be fixed at any convenient height, or even to lay on the bottom to warm the rider's feet.

For omnibuses and railway carriages I think a different application of the system is preferable. An inclined tube will convey from the spheric tumbril to the bottom of the carriage two or more hot bullets, and let them drop, through openings to be afterwards closed, into a long iron box, surrounded by a thin railing which the feet can touch with no inconvenience. This box will act as a stove.

In places of public exhibitions, bullets of larger size than in other cases, say of fifty or sixty pounds weight, may be properly used near such spots as chiefly would or deserve to attract the especial attention of visitors. Each bullet should be suspended at a convenient height, either from the ceiling, or from the top of a curved iron rod, fixed on the floor. A round metallic reflector horizontally suspended above the bullet should direct all the calorific rays of the upper hemisphere on a circle of the floor, around the periphery of which a number of persons might be comfortably seated. Some hot bullets may be warmed by some other process. For the visitors wearing usually the same full dress as in the open streets, the air within ought not to be so warm as in apartments; yet many, either on entering, or after having remained there motionless for a length of time, may like some warming by radiation.

I shall go into more particular explanations, if wanted, when especial experiments may have both enlarged and possibly rectified my actual ideas on the subject. In the

mean time, however, I hope, that the desirability of having this simple yet or rather all the more practicable conception carried into effect, is sufficiently appa= rent. The possibility of supplying heat where no other warming apparatus could possibly or at least easily exist, is surely a circumstance of considerable weight. The cheapness of the proposed system, its extreme portability, the facility of its being used on the very spot and direction where it may be most wanted at any moment, and in any variety of circumstances, lastly its absolute freedom from dust, from smoke, and from deleterious gaseous emanations, no one can fail to ac= knowledge as valuable advantages. Some persons, indeed, have suggested that hot iron decomposes air: a notion repugnant to the most elementary principles of chemistry. The prejudice arose from the real unwholesomeness of iron stoves excessively heated. The cause, however, of such unwholesomeness depends on the powerful draft of a column of rarefied air which is continually ascending along the external surface of the overheated stove, and its flue: for this external draft causes a part of the noxious gases generated within the stove, to find vent through the vimes, and expand in the room.

By its extreme simplicity and obviousness, my conception could hardly be decorated with the name of invention in the language of science; but it has a claim to such a title according to the strict definition of the law. There is no discovery of any new principle, but it is a systematic and well under= stood application of known doctrines and facts to a new object. Nether would heating, for the purpose of warming the same place where it is heated, be a new de= vice; for this is effectively applied in the example above alluded to, of the iron stoves. Even heating one especial kind of incombustible bodies in one place, and carry= ing it to another, is a notion already and since lov[el]y acted upon: it is namely practiced with water. What, to the best of my knowledge is really new, is the con= ception, and still more surely, the method of heating iron or indeed any solid body in one place and carrying it to another, not for the sake of destruction, as in war, but for usefully

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supplying the place of fire. I claim the protection of the liberal laws
of England on this invention, not so much for the sake of my personal ad=
vantage, as for ensuring its success, and thereby contributing to lessen the
sufferings of my fellow men.

Quiricus Filopanti