but will they forever satisfy the public? When on one single railroad eighteen broken rails are taken up in one day; and on another the train stops four times in less than ninety miles to have broken rails replaced by whole ones; and when it is found that a boiler which exploded had ten out of fourteen head stays broken off for weeks before it blew up, it is about time that either intelligent mechanics and engineers be placed on these juries of inquest or the farce itself be omitted. Your paper has always denied the necessity of attributing boiler explosions to mysterious causes, and I sincerely hope you will continue as heretofore to expose the pretensions of self-sufficient charlatans. B. F. G.

New York city.

Onions and Epidemics.

MESSRS. EDITORS:—In the spring of 1849 I was in charge of one hundred men on shipboard, with the cholera among the men. We had onions, which a number of the men ate freely. Those who did so were soon attacked, and nearly all died. As soon as I made this discovery their use was forbidden. After mature reflection I came to the conclusion that onions should never be eaten during the prevalence of epidemics, for the reason that they absorb the virus and communicate the disease, and that the proper use for them is sliced and placed in the sick room, and replaced with fresh ones every few hours.

It is a well established fact that onions will extract the poison of snakes; this I personally know. Some kinds of mud will do the same.

After maintaining the foregoing opinion for eighteen years, I have found the following well attested: Onions placed in the room where there is small-pox will blister, and decompose with great rapidity; not only so, but will prevent the spread of the disease. I think as a disinfectant they have no equal, when properly used; but keep them out of the stomach.

If need be, the foregoing (which I have greatly abbreviated) can be attested on oath. Let us have all the facts bearing upon the subject. JOHN B. WOLFF.

BEMENT & DOUGHERTY'S STEAM HAMMERS.

The illustrations in this article represent three of the different styles of steam hammers built by Messrs. Bement & Dougherty, of Philadelphia. The hammers are rated or classified according to the effective weight of the piston and hammer head or drop, and range from 100 pounds up to 10 tuns.

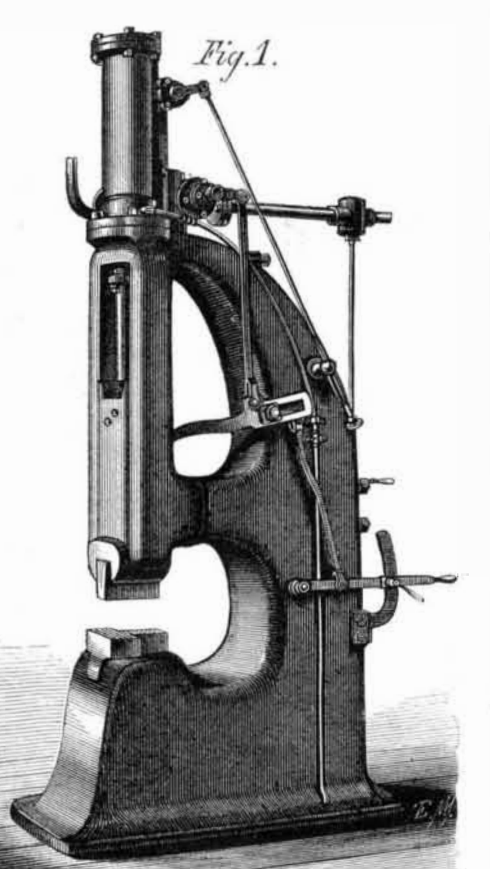
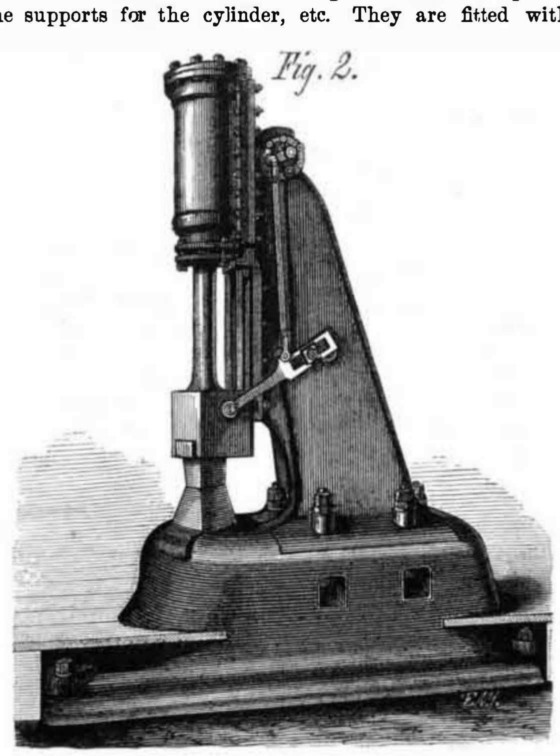
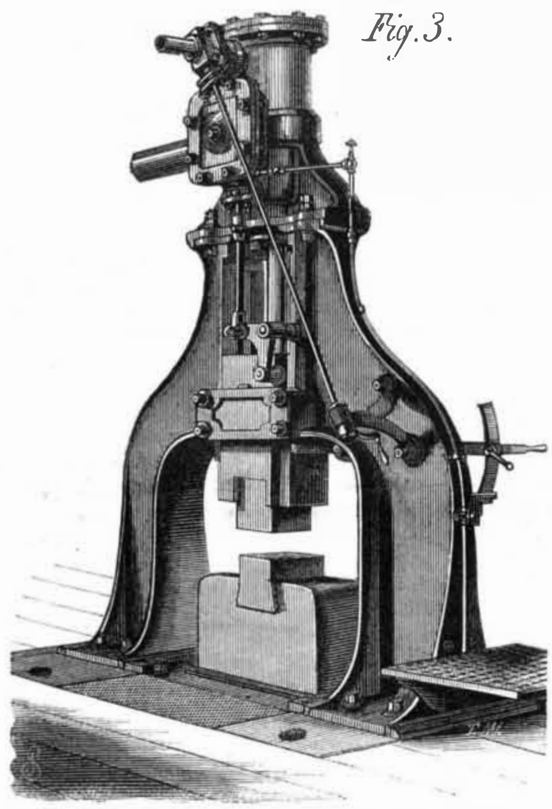


Fig. 1 is a perspective view of a 500-pound hammer whose anvil and frame are cast in one piece, to which are bolted the cylinder, guides, etc. It is fitted with an improved valve motion which can be worked at pleasure, single or double acting, adjusting itself to all variations in the thickness of the forging, controlling the admission of steam so as to produce at will a short and quick or a long and slow stroke, and graduating from the light-cushioned blow to the "dead blow," in which no steam is admitted beneath the piston until after the blow is struck, thus utilizing the *vis viva* of the falling weight impelled by the top steam. It can also be used as an ordinary hand-working hammer without altering the setting of the gear.

Fig. 2 shows a 1,000-pound hammer whose frame is keyed and bolted to a massive casting which forms the anvil and base, and expands below the level of the floor to such an extent and mass as to absorb the concussion and thus enables the foundation to be of the least expensive character. The piston rod and drop are of wrought iron forged in one piece. The piston head is of steel and also the guide, which is so arranged behind the drop as to leave the hammer face and dies entirely clear for convenient working. It has the same valve motion as that of Fig. 1, the details, however, not being seen on the side presented, they being sufficiently shown in Fig. 1. Messrs. Bement & Dougherty do not, however, restrict themselves to these designs, but are prepared to build these sizes of hammers with separate anvils if desired.

The 1,500-pound, 2,000-pound, and 3,000-pound hammers being similar in design and differing only in dimensions, are sufficiently illustrated by Fig. 3. They have separate anvils and double frames which form the guides for the drop and the supports for the cylinder, etc. They are fitted with





balanced slide valves of superior construction whose variable and self-acting motion is produced by the well-known expedient of a rock lever operated by an inclined slot or groove planed in the hammer drop.

Owing to the improvements made in many minor features since the photographs were taken from which these engravings were prepared, they can be said to give a correct idea only of the general style or design of these hammers. [See advertisement on another page.]

History of a Rail of Bessemer Steel.

In the early part of the year 1857 a steel bloom was made by melting in crucibles Bessemer metal with spiegeleisen. This bloom was rolled into a double-headed rail, and in the spring of 1857 it was laid down at Derby station. On the 21st of December, 1867, ten years and six months after it had been laid down, it was reported to be apparently little the worse for wear. Now the wear amounted to, on an average, 250 trains passing over it daily, and a like number of transits of engines and tenders. Reckoning now the weight of each train at 100 tuns average, and that of engines and tenders at 20 tuns, we have an amount of 30,000 tuns per diem passing over this rail, and this continued for, say 300 days per annum, 10½ years, gives a total of 94,500,000 tuns. Now on the Canadian railways the iron rails are worn out by a traffic ranging from 4 millions to 30 millions of tuns, according to the quality of the iron rails. The Derby rail, therefore, of Bessemer steel, has already sustained more than three times the amount of traffic which suffices to destroy the best iron rails, and, in spite of this, it is still "apparently little the worse for wear." The opponents of steel rails will argue, no doubt, that this rail is an exception, and was better than other Bessemer steel rails, because the metal was remelted. Such, however, is not the fact, for steel is always more or less deteriorated by remelting; and the rail ends from Bessemer steel rails, made at Crewe, and therefore, of course, the rails themselves, are of as good and as durable a quality of steel as this Derby rail. ROBERT MUSHET.

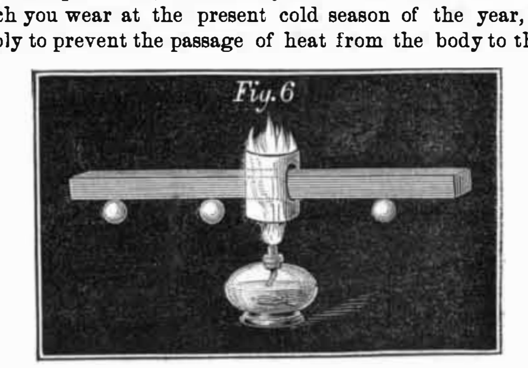
Science Familiarly Illustrated.

HEAT AND COLD.

BY JOHN TYNDALL, ESQ., LL. D., F.R S.

Lecture IV---Continued.

I have now to say a few words upon another subject—the propagation of this thing we call heat—this curious quivering motion of the atoms of bodies; and in order to make this evident to you, I will, first of all, make an experiment or two on liquid bodies, or on gases. I want you to understand the manner in which heat distributes itself in gases, and, for that purpose, I have here placed a little piece of platinum wire—that metal which we raised to a bright white heat in our first lecture. It is a refractory metal, and bears a very large amount of heat. Now, we will have the room made dark, and Mr. Chapman will excite our electric lamp, and I will ask you to look at the shadow caused by this little platinum wire on the screen. I trust that even the most distant young philosopher now sees that shadow. We will heat the platinum wire by an electric current, and you will observe two things. You see, first of all, that the platinum wire gets longer—swags, sinks down—when I heat it. Observe also the air rising up from the surface of the heated wire. That wave-like motion is due to currents of heated air rising from the wire. The air, when heated, rises in that way. The same is true of liquids; I have here a glass cell containing cold water, which will enable you to see this. I will place it in front of the lamp, and cast an image of it upon the screen. There is a means of warming this spiral of platinum wire within the water, and I want you to observe that the same thing occurs in water as you saw taking place with the air just now. Mr. Cottrell will now make the circuit for the electric current to pass; and then the moment the circuit is made you will find that the water will be heated by this spiral of platinum wire and the heated particles of water will rise to the surface of the liquid. There, on the screen, you see the action of the hot wire upon the water, causing the water to rise in these *striæ*. The water goes up from the heated surface, and in time the heated particles will distribute themselves through the entire mass of the water. I make this experiment in order to fix upon your minds the difference between this action and another which resembles it at first sight. The action which I have shown you receives the name of *convection*, which I should like the elder boys to remember, and I want you to distinguish between this and another process, which is a very different one, and which is called *conduction*. In order to illustrate this subject of conduction, I have placed here before you an iron bar and a copper bar (Fig. 6), and I want to ask them which conducts heat best. Mr. Cottrell will now light a lamp, and place it underneath the bars, so as to heat the ends of them at the same time; and as they become hot they will liberate these little balls, which are fixed on with wax; and I think you will find that the heat will travel along the copper better than along the iron. Here is a similar apparatus, with bits of tallow candle fixed to it. The greater the number of these pieces of candle that drop away from either bar, the further and better the heat has traveled through that body. This is almost a better experiment than the more elaborate one, and it is one which you can make at home for yourselves. The copper will be able to melt away all its candles, while the iron will not be able to do so. The whole philosophy of the clothes you wear is, that they are bad conductors of heat. Your bodies are sources of heat. Through the burning up of the food you eat, within your bodies, warmth is produced; and the object of the woolen clothes which you wear at the present cold season of the year, is simply to prevent the passage of heat from the body to the



air. For this reason we clothe the body with woolen cloth, that being one of the worst conductors of heat in nature. But the cloth has no warmth in itself; if I want to keep ice cool, as I did in a former lecture, I wrap my ice in flannel, which prevents the heat from without coming to the ice. Thus the woolen cloth simply prevents the transfer of heat in either direction, and hence the value of these non conductors as articles of clothing.

The experiment with the pieces of candle sufficiently illustrates the fact that different materials differ in their power of conducting heat. I might also show you this in another way. If I warm this piece of iron by putting it into warm water, and then place it upon a cylinder of glass which stands on the face of the thermo-electric pile, that glass does not allow the heat to pass through to the pile, and the needle still remains on the side of cold. It would be a long time before the heat of this iron passed through the glass and reached the face of the pile. I will now remove the glass and place a cylinder of copper on the face of the pile, and then put the warm iron on the copper. I suppose that not more than two or three seconds will elapse before the heat will pass by the conduction of the copper to the face of the pile, and the moment it does so you will see that the needle will come to the other side of the middle line, showing heat. Now, in this