Noise and Nerves

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which accumulated each day beside Miss Keller's machine, there was no difference in the number of errors made, whether the room was full of echoing sounds or whether the sounds were deadened. This may explain why the typist herself thought she was not being disturbed by the noises. But Dr. Laird's figures show that the typist was keeping up her accuracy at the expense of speed and only by an increasing drain on her energy.

When the really noisy conditions were in full swing, the energy demand quickly mounted 20 per cent higher than it had been with the vibrations deadened. And as the experiment progressed the drain on the typist's energy increased as she tried to overcome the bombardment of echoes from the brick walls.

This energy output was measured, Dr. Laird explained, by analyzing the typist's breath. The gas mask into which she breathed carried the breath out through a long tube into the next room, where it was measured in a gas meter. Every fifteen minutes a laboratory assistant examined the air sent through the tube and reported the percentages of oxygen and carbon dioxide it contained. From this the greater energy output in the noisy room was shown.

The psychologist's stop watch showed equally marked contrasts in the typist's speed. In quiet conditions, her speed steadily increased for two hours, it was found. But in noisy conditions, her speed fell off after about 45 minutes.

Even the time taken to slip a new sheet of paper in the typewriter increases when a room is full of noise and confusion, Dr. Laird's tests indicate. And if accuracy is kept up, as Miss Keller kept it up by considerable skill at concentration, the mental effort causes fatigue to set in rapidly.

On the second morning of typing in the noisy room, this speed typist, who is used to working under stresses and strains, became exhausted before the test period was up and had to be helped out of the room by an assistant. Yet she went back later, and Dr. Laird pronounced that she stood up well under the experiment.

On the last day of the test, the noise machine was turned off, and the typist worked in an absolutely quiet room. Results of this day's work did not differ appreciably from the results in the room with covered walls, Dr. Laird found.

This may indicate that some noise is not harmful to the individual's efficiency or physical condition, he suggests.

It might be said that this is only one individual, and that other people may be affected differently, or not at all. But Dr. Laird points out that somewhat similar tests which he has recently made with typists of average ability show the same general tendencies. Some, who had less power of concentration than the speed typist, ran up a high record for making mistakes when the telephone bells and the phonograph filled the brick-walled room. All of the "just average" typists lost speed, and most of them spent about 35 per cent more energy in fighting the noise.

From such experiments and from experiments of other scientists, Dr. Laird concludes that "in general, the better typist the more she is adversely affected by noise; amateur typists in such tests have not been measurably bothered by noisy surroundings."

Other psychologists have been struck by the importance of the same problem of what noise can do to fingers at work or to a brain that is trying to struggle with an idea.

Dr. Linus W. Kline, working in the Harvard psychological laboratory, tied tin cans together and dragged them back and forth across a room, while obliging students helping him with the experiment tried to concentrate on mental problems. The noise of the tin cans, the professor found, interfered appreciably with the students' progress in learning.

Another psychologist, Dr. John J. B. Morgan, working at Columbia University, rigged up a typewriter, so that the amount of pressure on the keys was recorded. While students typed he ran off a Noah's Ark phonograph record, and found that the animal sounds bothered the typists and caused them to use up more energy and exert more pressure on the keys.

It has long been realized that coppersmiths, kettlesmiths, and railroad engineers, who work all day to the accompaniment of loud noises, are apt to become gradually deafened. It is a newer idea that ears are sufficiently sensitive so that they show greater signs of fatigue after an ordinary individual's working day or at the end of the week. But this was recently demonstrated by four scientists at the University of Wisconsin, using for their apparatus only a watch mounted on a moving carriage. The distance

(*Just turn the page*)

PHYSICS

"Sick" Electric Lamps

That a "disease" of electric lamps, due not to microbe, but a combined physical and chemical phenomenon, may be the clue to some diseased conditions of men and animals, is the suggestion thrown out by Sir Oliver Lodge, famous British scientist, in the magazine *Nature*.

The lamp filament "disease," he says, was called to his attention by Dr. C. C. Paterson, director of the General Electric Research Laboratories in England. Its effect is to thin the filament in one place and thicken it in another, which causes the lamp to burn out to an untimely death.

A minute amount of water vabor in the lamp is the poison that causes the effect. Water, whether in liquid or vapor form, consists of hydrogen and oxygen. Inside the electric lamp, the heat of the filament causes the molecules of water to break up into atoms of hydrogen and oxygen. The free oxygen combines with some of the tungsten of the filament to form tungsten oxide, just as oxygen in the air combines with iron to form iron oxide, or iron rust.

But when a molecule of tungsten "rust" is formed, it is soon deposited on another part of the filament, slightly cooler than the part from whence it came.

In the cooler parts of the filament, the free hydrogen atoms pull the oxygen out of the tungsten oxide, and the tungsten is left on the filament in a different place from where it started. Then the water molecule, formed of the reunited hydrogen and oxygen atoms, is free to return to the thin part of the filament to take away some more tungsten. The thin part becomes still thinner, the resistance to the current becomes greater, and this part of the filament becomes hotter, and the action is speeded up.

As the action is due to water vapor, the obvious remedy is to make sure that no water vapor is left in the bulb. Sir Oliver suggests that some similar impurity might be present in the blood or tissues which may act in such a way in building up local growths at the expense of other parts of the body. He commends this to the attention of biologists and points out that salt solutions, and liquids similar to those in the body, are known to behave in a very similar way to gases.

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Oysters and clams contain about 200 times as much iodine as beefsteak.