this is not essential. This arrangement will keep the terminal plate charged to the potential due to the chemical relations and number of cells in the battery. If the battery be placed in the line wire it will keep both ends of the line charged. A Volta's pile may be substituted for the battery in either place, and so may a charged condenser of any capacity, the electrically charged terminals in this system acting in a way analogous to the permanent magnets in the magnetic system.

There are various other ways of employing condensers, and as one would infer from the preceding descriptions of the phenomena, these condensers will talk, that is, they will reproduce in sound the varying electrical conditions to which they may be subjected, as will also either a battery or a Volta's pile.

I have often heard them talk, and have made many experiments with such receivers.

Several other diagrams are also added, showing some of the various ways in which the system may be employed.

In perfecting this new telephone Professor Dolbear has given long and constant study to the scientific problems involved, while the mechanical construction has been prosecuted by Mr. H. C. Buck, aided by skilled machinists and competent assistants. The above concise description in the inventor's own words will give our readers a clear understanding of the principles that underlie his interesting invention, and it only remains for us to describe in brief the several figures in our front page engraving.

Fig. 1 shows the telephone in actual use, the transmitter being secured to the wall, the battery and induction coil being placed in a box on the floor, or in a convenient closet. Fig. 2 is a perspective view of the new receiver; Fig. 3 a face view of the same, with a portion of the casing broken away to show the connection of the two binding posts, A B, with the diaphragms, C D, and the adjusting screws by which the distance between the diaphragms is regulated are shown in the sectional view Fig. 4

Fig. 5 illustrates the principle of electrical attraction upon which the action of the new receiver is based; the electrostatic charge received by the plate, E, from the induction coil attracts the pith ball suspended in front of the plate.

Fig. 6 shows the two plates, E, of an Epinus condenser, placed near together and connected with the terminals of the secondary wire of the induction coil, I, and used as a telephone receiver.

Fig. 7 shows an induction coil with a separable primary for illustrating the principles of electrical induction.

Fig. 8 illustrates the manner of securing telephonic communication through ordinary medical electrodes.

Fig. 9 illustrates the essential features of the new telephonic system. I being the induction coil whose primary is in circuit with the battery, B, and transmitter, T, the receivers, R, are each connected with a single terminal of the secondary wire of the coil, I.

Figure 10 shows Professor Dolbear's experimental telephone transmitter. In this instrument the diaphragm, A, is horizontal, and carries a carbon electrode, upon which rests a movable carbon electrode connected by an arm with a delicately pivoted bar supported by the diaphragm cell. The local circuit is from the battery, B, through the carbon electrodes, and through the primary of the induction coil, I.

Fig. 11 shows the exhibit prepared for the Paris Electrical Exhibition, and intended to represent the perfected telephone system. It shows two similar instruments, which in practice are placed at opposite ends of the telephone line. T is the transmitter, B the battery, I the induction coil, R the receiver, and G the ground. *b* is a key for cutting out the receiver when it is desired to talk. *d e* are the primary wires, *f* the secondary wire leading to the key, *h* the line connection of the receiver, and *i* is the ground connection of the receiver.

MECHANICAL INVENTIONS.

Mr. Herman W. Vitt, of Union, Mo., has patented an improved device for communicating motion from the spindle to the stone, the construction being such as to allow the runner to run true, though the spindle may be out of tram or sprung.

Mr. Charles O. Dougherty, of Crisfield, Md., has patented an improved windlass for oyster dredges, by which, in case of accident or when it is desired to allow the dredge line to pay out rapidly, the machinery may be quickly thrown out of gear, and the spool on which the dredge line is wound be allowed to revolve freely on the shaft.

A new and improved machine for rolling axles, rivets, bolts, and other articles, has been patented by Mr. John H. Whitney, of New York city. The metal is fed into the machine through a suitable guide consisting of a loose flanged short tube held between two or more rollers or adjustable slides, the metal being held between the rollers by a pair of automatic tongs, which close as the work progresses.

An improvement in hoisting apparatus has been patented by Mr. John George Speidel, of Reading, Pa. The object of this invention is to provide for lifting variable loads, to insure safety, and to compass those objects by an apparatus of a portable nature. The invention consists in a block provided with differential gearing of novel arrangement, in safety-stop devices and automatic brake mechanism, acting by weight of load.

Mr. Charles K. Hamilton, of Lebanon, Ohio, has patented an improved air pump so constructed that it can be readily changed from exhaust pumps to condensing pumps.

How to Detect Carbonic Oxide in the Smallest Quantities.

One of the important sanitary problems is to detect in the air of our dwellings very small admixtures of carbonic oxide. The following test, furnished by Vogel, has long been regarded as the most simple and unfailing: To a flask of water exposed to the air under examination add blood very much diluted. Carbonic acid is shown by the immediate reddening of the mixture. The addition of ammonia sulphide does not banish the absorption lines in the spectroscope as with ordinary diluted blood. This test will show the presence of a portion as small as 0·25 of 1 per cent. Experiments show, however, that the oxide may not all be absorbed in this manner.

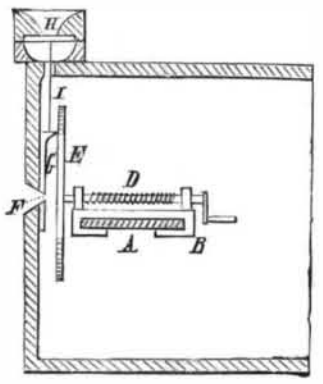
Dr. Walter Hempel uses the lungs of living mice to gather the gas from the room. The mouse experimented upon is then drowned, and blood from the region of the heart is tested with fresh, colorless ammonia sulphide. In this way 0·03 of 1 per cent can be easily detected, and strong symptoms of poisoning are shown with as little as 0·05 of 1 per cent of the gas. Since carbonic oxide is not, like carbonic acid, an unavoidable ingredient of the atmosphere, it becomes a matter of great importance to determine and prevent its presence.

PHOTOGRAPHING THE VIBRATIONS OF THE VOICE.

BY C. CUTTRISS.

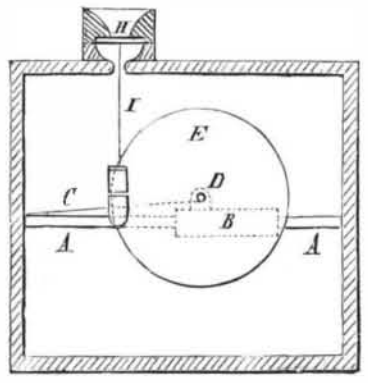
Reading of the experiments of Messrs. Bell and Tainter on the photophone, the idea struck me that the vibrations of the voice might be photographed. Not having the facilities to carry out the experiments, I communicated the idea, with a sketch, to my brother, Thomas Cuttriss, Leeds, who has carried it out as follows: A box, blacked inside, has a shelf, A, on which slides the saddle, B, which carries the

Fig. 1.



plate, E, and shaft, D, by which the plate is rotated. C is a silk thread fastened at one end to the shelf, the other being wrapped round the shaft, D, in that way, when the shaft is turned, traversing the plate in front of the slit, F, and the movable shutter, G. The shutter is connected to the diaphragm, H, by the wire, I, and is opened and closed

Fig. 2.



by the vibrations of the diaphragm. A powerful light is focused upon the slit (sunlight was used in our experiments), and the plate rotated as steadily as possible while speaking upon the diaphragm.

The plate, on being developed, showed a spiral, across which were dark lines showing on the outer circles the vibrations of the diaphragm very distinctly (see Fig. 3); but owing to the much slower speed of the plate, as it drew

Fig. 3.

nearer the center, the vibrations there merged into a dense fog, and were lost.

The vibrations are similar to the indents on the tinfoil of Edison's phonograph. We are now trying to reproduce the words by the action of light transmitted through the negative upon a gelatine film, using that in like manner to the tinfoil in the phonograph. The plate used was an ordinary wet negative.

SILK CULTURE IN AMERICA.

A prominent silk manufacturer remarked to the writer: "Were I to go into silk raising I would send my cocoons to France or Italy to be reeled."

The president of the Silk Association of America, at one of their meetings, when a Mr. Lowery, of Huntsville, Ala., addressed them on the subject of silk raising, asking aid and information, said he understood the difficulty of silk raising in this country commenced with the reeling; or, in other words, commenced after it was raised. This is the whole subject in a nutshell. We can raise silk in any quantity, but reeling is manufacturing requiring machinery and skill. It is worth three dollars per pound to reel silk from the cocoon, even and fine as required for our best organzin for warps. Our manufacturers now get the benefit of the labor of foreign factories duty free by calling this "raw silk." Let it be ever so slightly twisted and it is called thrown, and must pay a duty of thirty-five per cent. Our throwster is protected from the foreign throwster by a duty of thirty-five per cent; or a silk worth six dollars, two dollars and ten cents is added, making it cost eight dollars and ten cents. He gets the reeled "raw silk," on which has been expended three dollars in labor, for five dollars, the whole work of throwing into organzin, "the most costly of all threads," costs only one dollar and twenty-five cents, making seven dollars and twenty-five cents, against eight dollars and ten cents, to import, so creating a monopoly, for this price covers every expense—factory, machinery, and labor.

It is plain to see that unless the reeling from the cocoon in this country receives like protection with the spinning it can never be done here, and that simply means and explains why one manufacturer says he would, if he raised cocoons, send them to France or Italy to be reeled, and what may be understood by the observation of the president of the Silk Association of America—"the difficulty of silk raising in this country commenced with the reeling." Now, if this is a difficulty in the way of the throwster, then the throwster is a difficulty in the way of the weaver, and the weaver in the way of the consumer. But the consumer says, for reasons of indirect benefit, "I consent to this tax," and the greatest benefit accrues from the largest amount of profitable employment and the greatest saving of outlay to the country. By raising our own silk we should save an immense amount in wealth and more than double the labor in the production and reeling the silk, independent of raising the cocoon. The money value of reeling is three dollars per pound, against the average work on all threads "after reeling" not to exceed one dollar.

I present these facts for consideration. We now permit the throwster to do three-fourths of his legitimate work in foreign factories, bring it here to the exclusion of the most artistic and valuable branch of the silk manufacture, and certainly what would be one of our most valuable and interesting products.

No one who understands doubts our ability to raise silk. Our silkworms' eggs are now exported to improve the stock of older countries, where we have been taught to look for excellence. Then why do we not reel it? The strength, luster, and evenness of American silk are excelled by none, and it is far superior to many brands now imported.

LEWIS LEIGH.

New Haven, Ct.

Insectivorous Plants in Florida.

To the Editor of the Scientific American:

In your issue of May 28, Mr. Peter Henderson has a short article entitled "Insectivorous Plants," in which he demonstrates by experiment that the "Carolina fly-trap" (*Dionea muscicipula*) and the "cruel plant" (*Physianthus albens*) are not truly insectivorous, *i. e.*, do not depend upon insectivorous food for their nourishment and growth.

Now, in Florida we have several so-called insectivorous plants, which, for the past three or four years, I have examined and watched very carefully, and have arrived at precisely the same conclusion in regard to them as Mr. Henderson and Professor Tait have in regard to the above, viz., "that the so-called feeding of the plants in no way conduced to their health or vigor, being identical in all respects with those that had not received insects."

Among those the largest and most important is the "spotted pitcher plant" (*Sarracenia variolaris*), found growing abundantly along the edges of our swamps.

From this plant I have taken at different times hundreds of insects, alive or in a more or less state of decay, among which were numerous species of ants, centipedes, bugs (*Hempitera*), beetles (*Coleoptera*), etc

The inside of this "natural insect trap" is covered with fine, bristle-like hairs, which seem to be sensitive to touch, and woe to the unlucky insect that enters therein; for these hairs entwining it with a "siren's" embrace, the insect, after a few ineffectual attempts to reach the opening at the top of the leaf and thus escape, becomes exhausted, and at last, overpowered by the fumes and gases of the decaying, putrefying mass below, dies, drops to the bottom, and in a few hours becomes part and parcel of the same, and possibly an accomplice for the destruction of some near relative.

Attracted by this putrefying mass a flesh-fly (*Sarcophaga sarraceniæ*, Riley) drops an egg into it, and the larva which hatches therefrom takes up its abode, finding plenty to feast upon in the decaying insects.

When ready to pupate this larva invariably descends into the ground, either through the side of the leaf or the stem of the plant, changes into a *puparium*, and transforms within eight or ten days into the perfect fly.

Many of these plants do not contain this putrefying mass of dead insects, and I can see no difference between them and the others in growth or appearance, and I have since accepted many statements in regard to insectivorous plants, to use a Latin phrase, *cum grano salis*.

WM. H. ASHMEAD.

Jacksonville, Fla., May, 1881.

SHOOTING FINBACK WHALES.—Twenty finback whales were shot with bomb lances off Provincetown, Mass., May 14. The business of hunting these whales has lately become an important industry at that place.