As the pressure is constant, there must be an efflux, and should there be a small leak the passage of air will be from inside outward; thus preventing the ingress of the interior atmosphere.

The silicious bronze wires in the manufacturing exhibits demand, by reason of the important part they are likely to play in the future, more than a passing notice. In this era of great enterprises, where economic processes are continually sought after, that which combines a maximum efficiency with a minimum of labor is looked upon as the most desirable. Now, recent experience has shown that silicious bronze wire is about twenty-five per cent. cheaper than iron wire, everything considered, besides having nearly double the conductibility. So far as tensile strength per square inch of section is concerned, iron wire has no advantage. Perhaps this might be better explained by saying that the far greater weight of the iron wire costs more to handle, requires more and stronger supports and insulators, nearly twice as many posts, and more than twice as many couplings than silicious bronze. The subjoined tables, compiled by an authority, give the electrical resistances and approximate weights per mile of silicious bronze.

TELEPHONE WIRES.

Diameter.	Section.	Resistance in ohms per mile.	Weight per mile.
Mm.	Sq. mm.		Lb.
1	0·7854	103	24·6
1·05	0·8655	93	27·1
1·10	0·9503	92	30·0
1·15	1·0383	77	32·5
1·20	1·1310	71	35·6
1·25	1·2252	64	38·5
1·30	1·3273	61	41·6
1·35	1·4294	56	44·8
1·40	1·5393	51	48·3

TELEGRAPH WIRES.

1·25	1·22	22·5	38·5
1·50	1·7671	15·6	55·6
2·00	3 1416	8·8	99·2
2·25	4·4741	6·2	141
2 50	4·9087	5·6	156
2·75	5·938	4·6	187
3·00	7 0685	3·9	223
3·50	9·6211	2·8	303
4 00	12·5664	2·4	296
4·50	15·9043	1·8	502
5·00	19·6349	1·4	620

Now let us compare this silicious bronze wire with iron, steel, and copper wires, taking one millimeter as the diameter in each case.

Description of wire.	Tensile strength per sq. in. in tons.	Resistance per mile in ohms.	Relative conductivity.
Pure copper...............	17·78	33·1	100
Silicious bronze telegraph. ..	28·57	34·5	96
Silicious telephone...........	48·25	103	34
Phosphor-bronze telephone..	45·71	124	26
Swedish galvanized iron....	22·86	216	16
Galvanized Bessemer steel..	25·40	249	13

The galvanized wire of five millimeters diameter, now in general use, weighs about 540 pounds to the mile. It could be replaced by wires of silicious bronze, having a diameter of only two millimeters and weighing about a hundred pounds to the mile. Silicious bronze wire of 1·10 millimeters and weighing 29 pounds to the mile can readily be made to do the work of ordinary steel telephone wires of two millimeters diameter and weighing 87 pounds to the mile.

Among the exhibits of the Ordnance Department, or rather of its auxiliary, the Signal Service, is a field telegraph train by which telegraphic communication may be kept up between the several portions of an army or between scattered bodies of troops. This is an exceedingly important branch of the Ordnance Department in these days, and it must be said that those who designed the present system have acquitted themselves well. It is modeled after the French system, or rather it has many points in common with it, divested, be it said, of the elaborate and cumbersome details of the system employed in the French army, which, as was clearly demonstrated in the maneuvers of four *corps d'armee* last fall, can only be carried out under the most favorable conditions. The system exhibited by Captain Michaelis in the present Exposition has this to commend it, and may therefore be more than favorably contrasted with the French. It is designed for use as well under unfavorable conditions, viz., when time presses and in rough country, as when time is of no moment and a large body of trained men are at hand to carry out details. If it have a serious defect, it is that the line is too heavy for the service; the French linesman furnished with light silicious bronze wire being able to traverse a much longer distance, and the mass on the bobbins being very much less.

In measuring the velocity of projectiles, it is easily seen that our Ordnance Department is by no means behind the age; several new and interesting features having been recently introduced. A long tube has two delicate diaphragms within. These are electrically connected with a disk whereon the moment of their disturbance is recorded. As the projectile passes through, the two contacts are instantaneously signaled.

The instrument devised by Captain Le Boulenge of the Belgian artillery has given excellent results, one or two not important changes having recently been made by him. It can be used both as a micro-chronometer and as a velocimeter. Two electric circuits are established within a tube through which a projectile is fired.

When the first circuit is reached, it affects an electro-magnet having for armature a cylindrical rod acting as a chronometer, to which are attached two enveloping zinc tubes as recorders. When the second target in the tube is reached, it sends a current through an electro-magnet, the armature of which, shorter than the first described, is called the register. Then there is what is called an indenter; consisting of a circular knife fixed in a mainspring. This is readily primed by means of a catch on a lever. Now when the first circuit is reached the chronometer is made to fall, and upon the breaking of the second circuit the register also falls. This depresses the end of the lever, the mainspring is released, and the knife springs at the falling chronometer and leaves an indentation on the recorder. So simple is this instrument that only a short calculation is necessary in order to find the velocity of the projectile. The recorder is marked highest when the velocity is lowest. Of course it is necessary that the operator thoroughly understands the theory upon which the instrument is constructed, for certain allowances must, perforce, be made, for instance for the time required for the demagnetization of the chronometer and the register before the fall takes place. In advance of operations it is, of course, necessary to test the instrument; a disjunctor being used to examine both circuits.

The Schultz chronoscope, invented by Capt. Schultz of the French artillery, designed for measuring very short intervals of time, and the electro-ballistic pendulum, are also to be seen in the exhibit.

There is a very interesting exhibit in the theoretical department of the Exposition, on thermo-electricity. There are those who affirm that these machines will at some future day supplant the dynamo, as the dynamo has supplanted the galvanic battery. This thermo-electrical machine is made up of a system of plates composed of alloys of antimony and bismuth soldered together and properly joined in the usual way, the joints being heated by Bunsen burners.

A very interesting apparatus for safety from lightning is shown by a telephone company. It is designed to be placed outside of a building, and contains a lightning arrester and fusible wire, and a cut-out switch operated from the inside. By this the electric current can be wholly disconnected from the interior. The telephone subscriber upon leaving his office can entirely disconnect the instrument until his return, and old ladies who show a disposition to be timid as to lightning when thunder clouds prevail, may find in this a convenient means of arresting the lightning and their fears.

A curious feature of the Exposition is the important part taken therein by gas, in one form or another. It might fairly be claimed for the gas-motor that it is part of an electric-lighting plant. It would, however, be a refinement of sarcasm to set up such a claim for the gas lamp. But the gas lamp is there; not the little, flickering jet, combined, by reason of a clogged aperture, into one long, thin prong of flame, but represented in all the grandeur of a Siemens regenerative gas burner—intense and mellow. The admission of this lamp would seem to be but a simple act of justice, and as such does credit to the wisdom of those having the conduct of the Exposition, for, though it cannot from any point of view be classed under the head of electrical appliances or apparatus, it represents a system of lighting which the electric light is designed to supplant, and unbiased decision can only be reached by a comparison of the two systems side by side.

It must be said that the big gas lamp cuts a good figure, notwithstanding that the arc lamp—for, of course, there is no comparison between it and the small incandescent—is displayed under the most advantageous conditions. By this it is meant that the arc lamp, when standing alone, brilliantly illuminates certain portions of the space about it, and leaves other portions in deep shadow, while as it is displayed at the present Exposition the shadows are cut out by the glare of the adjacent lamps. It is only just to say this much; only simple justice to say that the arc lights are shown under favorable conditions, and that the big Siemens regenerative burners are shown under ordinary conditions; their light when isolated being evenly diffused, while the converse is the case with the arc light.

Subjoined is a table giving the consumption of gas per hour and the candle power of the gas burners at the Exposition:

Gas Consumption per hour.	Candle power.
100 cubic feet.	1,000 to 1.200
75 "	750 " 900
50 "	450 " 500
35 "	300 " 350
25 "	200 " 250
14 "	100 " 125
8 "	70 " 80

This, even if not an underestimate, shows that these lamps, with gas at $2.25 a thousand cubic feet, are fully as expensive as the arc lights, if the figures at which they are rented are reliable.

So far as the incandescent lights are concerned, they are holding their own, as it was known they would. On the hottest evenings they have neither vitiated the atmosphere nor sensibly heated it, whereas, were these hundreds of lights, now aglow, given off by gas, it is safe to say that the atmosphere of the great hall would be intolerable.

Correspondence.

Filtration of Oil.

To the Editor of the Scientific American:

One of your correspondents some time ago wished to know if there was any way to clean sperm oil so as to use it over again. I expected some one would give an answer, so I have waited to see what it would be; but seeing none, I take the liberty to state that I took a common wash boiler, had a faucet put in the bottom, and soldered on tin lugs about half way down inside, made a wooden frame that would go inside and rest on to the lugs. I tacked on to this frame for the bottom four thicknesses of coarse bagging; on to that I spread loose four thicknesses of cheese cloth, then sprinkled over the cloth coarse soft wood sawdust, then four thicknesses of cheese cloth, then sawdust again, for three successive times, with four thicknesses of cheese cloth on the top. I pour the oil into this frame within the boiler, and it will filter all the dirt out. It will become colored by constant use and filtering, but it will be free from dirt. I found by using this filter I have made ten gallons of sperm oil do the lubrication that would have taken thirty gallons. I think that is worth saving. Cheap filter, but it does the work.

GEO. BOXLEY.

Troy, N. Y., September, 1884.

Lifting of Persons by the Fingers.

To the Editor of the Scientific American:

Your answer to T. G. L. (No. 15), in the SCIENTIFIC AMERICAN of August 23, indicates that you have never tried the experiment referred to. I have in this manner:

Two persons stand on each side of a fifth, who is seated in a chair. The four raise their hands (which are clasped with the forefingers extended) as high as possible over their heads, at the same time inhaling deeply. They then simultaneously bow as low as possible (always facing the sitter), bending the body from the hips, and swinging the extended arms from the shoulder till the hands touch the knees, at the same time exhaling as strongly as possible, these motions being repeated three times together. As they rise from the last position for the third time, the extended forefingers are placed under the knees and arms of the sitter, and he is lifted high in air as light as a feather. In this way I have seen four young school girls, under sixteen years, lift a man of 180 pounds with no more apparent exertion than would be required to lift a three pound weight. To one who tries this experiment for the first time the result is very surprising.

"HAMLET."

Washington, D. C., Sept. 3, 1884.

The Liquefaction of Air.

M. Olzewski has contributed to the *Comptes Rendus* some of his further observations upon the temperature and critical pressure of air. He says he has obtained 6 cubic centimeters of air compressed into the liquid form. This air did not contain carbonic acid or aqueous vapor, and was allowed to evaporate in a vacuum, and also under atmospheric pressure. A very low temperature was thus produced, as low as —205° C., being observed when the evaporation took place *in vacuo*. It appeared, however, that the recorded temperature of the liquid air at the critical point was not so low as that of its constituents, oxygen and nitrogen, separately. Consequently, M. Olzewski was led to think that at the critical pressure the components separated; nitrogen evaporating in the larger proportion. Therefore, although air is a very convenient refrigerant, for various practical reasons M. Olzewski is disposed to prefer the use of nitrogen in his researches upon the liquefaction of hydrogen, as he thereby hopes to be able to command temperatures even lower than that given as the evaporation point of air in a vacuum.

Cost of Bread in Boston and New York.

Mr. Atkinson shows us that the farmer in Iowa receives $405 for the wheat to make 100 barrels of flour, and that the railroad then receives $117.50 for taking 450 bushels of wheat from Iowa to Chicago, and 100 barrels of flour from Chicago to Boston. Upon this the railways make about $35 profit. It costs $50 to mill the flour, $45 for barrels, $30 for the merchant's commission and the cartage in Boston, $410 for the labor of making 100 barrels of flour into bread, for fuel with which to bake it, yeast, salt, etc., costing only $1,057.50 from the farmer on to the baker's counter for 100 barrels of flour made into bread, 270 to 290 pounds per barrel, or about 3½ cents per pound, while the people of Boston pay $1,620, or about six cents per pound, against 3½ cents in New York.

Economy of Expense of Management in Life Insurance.

The current issue of the SCIENTIFIC AMERICAN SUPPLEMENT contains a very able article on this subject, written by Walter C. Wright, Actuary of the New England Mutual Life Insurance Company. The article will repay careful perusal, and the tabular statement which accompanies it will be found of much value to any one interested in life insurance, as it shows both the expense per $100 of claims paid and the net rate of interest earned. These figures are taken from the official reports of the various companies, and furnish conclusive proof as to which of the companies are the best and safest.