gave an approximately parallel bundle of rays, the third serving to converge these at its focus, which was, of course, 8 or 9 inches in front. The question is often asked: Could we not, by using very large condensers, obtain such an increase of light that an ordinary lamp or the like would serve in place of the intenser forms of illuminator? The reply to this involves several points. In the first place, unless the glass is specially ordered, it cannot be obtained much more than one and a quarter inches thick; from this, if we make large lenses, they will be of proportionally long focus, and so the light will be further off. To take an example, I have a set of condensers, 8 inches in diameter, consisting of three lenses made as thick and, consequently, of as short focus as the ordinary glass would allow. The curves are as follows, all the lenses being bi-convex:

| | | |
|---|---|---|
| 1st surface | 10 inches radius | 7 inches diameter. |
| 2d " | 7 " " | |
| 3d " | 50 " " | 8 inches diameter. |
| 4th " | 10 " " | |
| 5th " | 10 " " | |
| 6th " | 50 " " | |

The focus is here about 4 inches from the first lens; and thus the amount of light transmitted is no greater than with the 5 inch combination whose focus was 2 inches from the first lens. Such a set of condensers is of great value in certain cases from its enabling us to employ large objects; but it requires as powerful a source of light as the smaller one to obtain with it an equal effect.

In the next place, however, let us suppose that, without regard to cost, we obtained a large lens of short focus. Then all the errors would be greatly increased, and a heavy loss of light would be experienced, by reflection at the surfaces on which the light would fall at angles unfavorable for transmission. Another yet more serious difficulty arises from the fact that all these less brilliant sources of light have a very large area, and this, with the error of the lenses, causes such a scattering of the light that much is lost before it can reach the objective. There are other drawbacks to the use of large condensers which will be noticed further on, and on the whole we find that such a plan as that above suggested is quite impracticable.

## Correspondence.

### Property in Inventions.

*To the Editor of the Scientific American:*

In giving your views, suggested by the inquiries of Secretary Fish, in answer to his first interrogatory, you say: "A patent is a private monopoly, an infringement of equal rights, and therefore untenable on the ground of justice;" and again: "Every man in every community is bound by the strongest natural obligations freely to contribute his best powers of mind and body to promote the common welfare." As an abstract view, of rights and duties, this is possibly correct; as a practical view, of society as it is, it is rank heresy. For the inventor has no more obligation to give the public the fruit of his labors, invention, than the capitalist has to give the public the fruit of his labor, money.

A and B start in life, each with about the same amount of education, with correct habits, and each with $1,000 capital. A devotes himself to some useful and honorable calling, and by industry and economy, has at the end of five years increased his capital to $10,000. B devotes himself to the invention of some new and useful machine; at the end of five years, he has perfected his invention and procured a patent therefor; but he has expended his $1,000, and all he has found time to earn besides. You can from your observation in life continue the comparison, between A, respected, honored, courted, and B, out at elbows, out of friends, and very likely condemned by his frugal, industrious neighbors. Now, read this, and then tell us that the law protecting the inventor in the fruit of his labors is tyranny and an infringement of equal rights.

There may be a case where a man has blundered on an invention worth $100,000; there may also be a case where a man has blundered on an oil well, which he sells for $100,000; yet the latter is protected in his find for all time, or until he uses it up; while the former has, as a favor, the protection of the Government for a few years, if he pays a special fee for it.

Prescott, Kan. L. G. JEFFERS.

### Deep Sea Soundings.

*To the Editor of the Scientific American:*

I am a constant reader of the SCIENTIFIC AMERICAN, and have been very much interested during the past three or four months with the articles written on the above subject. The following objections appeared to me to belong to all the methods proposed:

1. Sinking a vessel filled with air of atmospheric pressure, thereby requiring a vessel of great strength and lightness, as well as great weights of iron or sand, which would make the whole thing clumsy, and cause it to require too much space in the ship.

2. The whole contrivance for sinking is lost at each observation.

3. The difficulty of ascertaining where the apparatus is floating after it has reached the surface. A flag, smoke or flame, might answer, provided that there was no drift and the sea was without a ripple. The stick leaping out of the water would be something like the

"Borealis rays,
Which flit ere you can mark the place."

In order to overcome these objections, I propose constructing a small vessel with two empty gas bags attached, one of them only being required, when inflated, to support the apparatus in the water and the other arranged so that, by the expansion of the hydrogen with which it would be filled, it would disengage itself from the vessel until it reached the length of a cord, say, twenty or thirty feet long; this bag would be constructed of light material so that, when it reached the surface, it would continue to ascend in the atmosphere; thus one bag would float the apparatus, and the other would be a balloon floating twenty or thirty feet directly over the spot where the whole could be found. I would arrange the vessel so that gas would be generated directly it touched the bottom, and, of course, at the pressure to be found at that depth.

I would accomplish this by either of the two following methods: 1. By an arrangement of cells to form a battery sufficiently powerful to decompose water, so that acidulated water with platinum terminals could go down in the vessel, which, upon contact with the bottom, could be made to connect with the battery, and so we should have oxygen in one bag and hydrogen in the other. 2. By filling the vessel with dilute sulphuric acid and granules of zinc, so arranged that, upon contact with the bottom, they could be let fall into the fluid, when hydrogen would be formed, to inflate both bags alike. The heat generated by this process might also be economized by using it to raise the temperature of the gas.

You will see that I have only described the vehicle which would convey the apparatus to the bottom and back; of course a registering apparatus would have to be attached. I will not trespass further upon your space by describing that part of the subject; but taking advantage of hints thrown out, time after time, in your valuable paper, I do not doubt accomplishing the following results: 1. Registering the temperature of the ocean at specified depths. 2. Registering the depth and dredging the ocean bottom.

Be ore venturing so far as to rush into print on this subject, I decided upon asking the opinion of my esteemed friend, Professor John Tyndall, and the following is a copy of his reply:

MY DEAR SIR:—Your idea appears to me to be a very ingenious one. I can say no more, as my thoughts have never been turned to this subject. Faithfully yours,

July 27. JOHN TYNDALL.

I trust that something will be found effective in this important matter. W. WALTON,

late of the Science and Art Department, South Kensington, England.

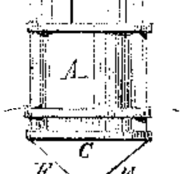
Williamsburgh, N. Y.

### Balloon Valves.

*To the Editor of the Scientific American:*

Now that Professor Wise is going to demonstrate the practicability of the theory I have long cherished, I wish to propose an improvement in the construction of the safety valve of a balloon, nothing of the kind having ever been devised that would give me satisfaction. The engraving will, I think, represent my idea.

A flanged cylindrical tube, B, is placed within A, and is flanged at the lower end to keep it from blowing out; D, D, are guide rods which may pass through the flanges, to prevent the upper cylinder head from settling towards one side and to insure a perfectly airtight joint. B is represented as being forced up by the gas; and 1, 2, and 3 show the openings by which the excess of gas will escape. The lower flange, C, will be inside of balloon, the end being open to admit the gas; E, E, and F, are a device for holding down the valve with a force equal to the amount of buoyant pressure of the gas; and the device must be regulated by a weight, as are all other valves. The upper face of A, and the under face of the head of B must be ground to a perfect joint, and may be supplied with a flexible gasket to prevent all leakage. As C passes freely back and forth through A, the valve can never get foul or fast in it, as has so often been the case, causing many disasters. The dotted lines represent the apex of the balloon. A glance will show any scientist how the valve can be secured in position. The whole apparatus may be made of any suitable metal or of vulcanized rubber.




If made of brass or other metal, would it be likely to attract electricity from the clouds and set fire to the gas?

Elsah, Ill. S. W. GREER.

### Mordants for Aniline Colors.

*To the Editor of the Scientific American:*

After perusing, on page 17 of your current volume, the article "Mordants for Aniline Colors," I am induced to make a few remarks on the subject. I have frequently used hot soap liquor as a mordant for aniline pinks, light and dark and found it to answer well. It is an easy, quick, and economical mode. For a deep, brilliant rose, I have generally found an annatto base, in combination with alum as a mordant, to be the best; it produces the most beautiful color. The sumach process is good for either light pinks or deep crimson shades, using it as a base for either double muriate of tin or tin crystals. In the hands of a skillful dyer, this process is very economical, for, by adding aniline in proportion to his shade, he can exhaust his dye bath. Tannin or sumach is the best known mordant yet for the aniline green. There is a mode of mordanting which has been much practiced in England and Scotland. It is the white liquor process, similar to the Turkey red, but not so complicated; it is, however, too tedious. It is claimed that it animalizes the cotton. Now this is the desideratum, namely, a cheap and quick mode of animalizing cotton, so that it would have as strong an affinity and absorb the aniline dyes, of all colors, as simply, quickly and easily as either silk or wool.

I have no doubt the Austerlitz mode is a very good one as to economy, but I scarcely think it will answer for all classes of fine yarns, as I am afraid it will stiffen or size the yarns too much. J. N.

Frankfort, Ky.

### A New Explanation of the Origin of Nerve Force.

Those who are unacquainted with the principles of the modern doctrines of thermo-dynamics will readily perceive that a difference of temperature in two bodies is a source of power, when they consider that a low pressure steam engine depends, for its power of doing work, on the difference of temperature between its boiler and condenser; and that a current may be maintained through a copper wire, if it is connected with a thermo electric battery of which the two ends are kept at different temperatures. In what are termed hot blooded animals, that is, in mammals and birds, the difference of temperature between the surface and the interior is considerable under all natural circumstances, and in them there is a regulating action of the skin, by which they maintain a uniform internal temperature, always hotter than the surface, whatever that of the external medium may be. In the sluggish so-called cold blooded animals, the temperature of the interior of the body is but slightly different from that of the air or water in which they live; that it must be higher is evident from the fact that destruction of tissue is continually going on in their bodies, which is always necessarily attended with the evolution of heat.

Such being the case, it is evident that, in the difference of temperature between the surface and the interior of the living body, there is an available source of energy, which is almost certainly employed advantageously throughout the whole animal kingdom; and what is more, it may reasonably be supposed to be that which gives rise to the electrical nerve current, as only one assumption is involved, and that not an improbable one, it being that a thermo-electric current is capable of being generated between soft tissues of different composition or structure. Physicists will be able to decide this question experimentally, and if they do so, they will do a service to physiology.

For the distribution of a current so generated, the construction of the nervous system is perfectly suited. Two sets of conductors are necessary, the one to carry the currents from the skin to the central organ, which arranges the direction that they must take, and the other to send them on to their destination: these are to be found in the afferent and efferent nerves. As in the telegraph system, no return conductor is necessary; for as the ends of the wires are put into connection with the earth, by which they are able to communicate, so the terminations of the nerves in the skin, muscle-corpuscles and otherwise where they lose their insulated coverings, place the extremities of the afferent and efferent nerves in communication through the intervention of the mass of body tissue. The brain and minor ganglia would then act like greater and lesser offices for the reception and transmission of currents in the required directions, being in fact the commutators of the system.

There are several of the most important phenomena exhibited by the nervous system which are very satisfactorily explained on the above hypothesis. For instance, in cold weather the impulse to action is much more powerfully felt than in summer when the air is hot, and therefore the temperature of the surface is higher. It is well known that it is impossible to remain for more than a very short time in a hot water bath, of which the temperature is as high as, or a little higher than, that of the body, on account of the faintness which is sure to come on, and this may be reasonably supposed to be the result of the cessation of the nerve current, which is consequent on the temperature of the surface of the body becoming the same as that of the interior. This faintness is immediately recovered from by the application of a cold douche. When great muscular exertion has to be sustained, as in running or rowing, it is always necessary to have the clothes very thin, and it is felt, during the time that it is necessary for the continuance of the effort, that the surface of the body must be kept cool.

As the termination of the nerves in the skin must correspond, on this hypothesis, with the cooled end of a thermo-electric battery, therefore the brain, which is very abundantly supplied with blood, and is the part of the body to which most of the nerves are directed, must be compared with the heated end; and as it is by the conversion of heat into electric current that the nerve force is developed, it is evident that heat must, to a certain extent, disappear as such in the brain, and that that organ must consequently be colder than the blood which enters it. This is exactly what Dr. John Davy observed in the case of the rabbits he experimented on, and his results have not been shown to be incorrect.—*A. H. Garrod, in Nature.*

NEW STYLE OF PAPER.—The English display at the Vienna Exposition an original manufacture, which is very strong and tough, and yet perfectly soft and pliable, like cloth. This is embossed and printed on, and is prepared for the purpose of hangings, curtains, etc., for which it seems very well adapted; some of the rooms of the British Commission are furnished with this. It is simply tacked to the walls, so that it can easily be removed at any time. In this case the curtains were of the same pattern as the walls, but lined with another style in light colors. It is handsome, cheap and durable.

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