

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS.

One copy, one year, postage included.....\$3 20
One copy, six months, postage included..... 1 60

Club Rates:

Ten copies, one year, each \$2 70, postage included.....\$27 00
Over ten copies, same rate each, postage included..... 2 70

By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given.

VOLUME XXXIII., No. 2. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, JULY 10, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

Answers to correspondents.....	26	May bugs, new use for.....	21
Astronomical notes.....	26	Measuring linings of stacks (41).....	27
Atmosphere's pressure, the (5).....	26	Motor deception, the Keely.....	16, 20
Babbitt metal (13).....	26	Motor, the Keely.....	20
Barometer, to make a (2).....	26	Oil for painting (12).....	26
Battery difficulty, a (52).....	26	Paint, decolorizing by.....	22
Battery for electric light (38).....	26	Paint from wool, removing (22).....	26
Belts and shafting (47, 48).....	26	Patents, American and foreign.....	26
Birds, memory in.....	26	Patents, list of Canadian.....	26
Boilers, low water in (31).....	26	Patents, official list of.....	26
Boilers, small (39).....	26	Planetary atmospheres, the.....	17
Bullets, projectiles, etc.....	26	Plaster cast prize, a.....	22
Business and personal.....	26	Plastering (24).....	26
Celluloid—what is it?.....	26	Plow spring, gang.....	22
Cement for cellar floors (11).....	26	Poisons, antidote for.....	21
Cement for iron and wood.....	26	Powder mill explosions.....	20
Cement on wood, filling (14).....	26	Practical mechanism—No. 26.....	21
Chemical studies (61).....	26	Pumping, power for (37).....	27
Chimneys, sooty, cure for.....	26	Rail, street railway.....	19
Chlorine, making (7).....	26	Railways, liability of.....	18
Chucks, lathe.....	26	Recipes, useful.....	24
Combustion, spontaneous (4).....	26	Residences, model.....	23
Dashboard, improved.....	26	Rope socket.....	18
Draft of vehicles (40).....	26	Rubber and oil (36).....	27
Dress, healthy.....	26	Snapper stamps, making (8).....	27
Engine, blooming mill.....	26	Shellac varnish for coils (37).....	27
Engines, cleaning (18) 26, (23).....	26	Senses, trustworthiness of the.....	16
Engines for boats (15, 17) 26, (29).....	26	Silks, weighted.....	26
Engines, speeding (19) 26, (36).....	26	Sirup, Alberting (1).....	26
Flanging machine.....	26	Slide valves, flat, etc., (34).....	27
Fly wheels, sections of (42).....	26	Smoke stacks, forms of (26).....	27
Freezing mixtures (3).....	26	Spark arresters (33).....	27
Gas blowpipe, a new.....	26	Springs under pressure (32).....	27
Gases for oxyhydrogen light (62).....	26	Springs, vehicle-driving (43).....	27
Gas lighters, electric (59).....	26	Steam horse, another.....	19
Glass manufacture, improved.....	26	Steam pipes, long (25).....	27
Glass, the Bastille.....	26	Ventilation, window.....	22
Glue, non-drying (16).....	26	Wheel, bluing (19).....	26
Grasshopper parasite, a.....	26	Steel, gun barrel (45).....	27
Grasshoppers, utilizing.....	19	Stevens Institute commencement.....	18
Guns and armor, cost of.....	26	Swindles, natural history of.....	17
Hand stamp, rotary.....	26	Telegraph relay, etc., (53).....	27
Heat by electricity (50).....	26	Testing vinegar.....	22
Hydraulic pressure (16).....	26	Thermostat, window.....	22
India rubber sidewalks.....	26	Vibration in an engine (44).....	27
Inventions, what they do.....	26	Water, feed, for boilers (35).....	27
Japanning, black (8).....	26	Water, flow of (64).....	27
Lathe, duplex wheel.....	26	Water in steam pipes (23).....	27
Light and electricity (49).....	26	Water, purifying (63).....	27
Lighting and telegraphs (56).....	26	Webster, Mr. Thomas.....	19
Lightning rods (55).....	26	Wheel, point on a (27).....	27
Magnet, coil (51).....	26	Wire cables, strains on (34).....	27
Magnetic curves, the.....	26	Wood pulp (5).....	26

THE TRUSTWORTHINESS OF THE SENSES.

This world is all a fleeting show, for man's delusion given, wailed poor Dr. Young, when the lady of his affections cruelly told him that, however much she might love his soul, she could not abide alliance with the diminutive casket that enshrined it.

Since that day thousands have sung the mournful song without the author's excuse, and curiously unconscious of the terrible charge it carried against the Being they were professedly worshipping. If the world is really such a misleading affair, for our delusion given, surely the giver of it can be nothing less than a swindler, an infinite swindler! It was no original thought of the love-lorn poet. It probably occurred to the first speculative loungeer that thought he recognized a phantom under world, mimicking the upper in some still pool.

It certainly creeps out in the earliest speculative writings. It had its disciples in India thousands of years ago. It was a fundamental dogma of the founder of Buddhism, who confessed it impossible to tell how far the world without us is a phantom, how far a reality. The followers of the Greek Pythagoras were more positive; the world and its phenomena, they said, are all illusions. Centuries later the Egyptian mystic Plotinus taught the same doctrine, that the external world is a mere phantom; and the mystical schools of Christianity took it up in turns. Nor did Mahomedan philosophy escape the delusion. The Arabian philosopher Algazzali writes in this strain: "I said to myself: During sleep you give to visions a reality and consistence, and you have no suspicion of their untruth. On awakening you are made aware that they were nothing but visions. What assurance have you that all you feel and know when you are awake does really exist?"

In every age the mystically inclined have delighted in dreaming that everything is a dream. A favorite American poet does it prettily in one of his poems. He lies on a grassy river bank, watching the clouds sail across the sky, seemingly far down in the still water. The image of a kingfisher flits across his vision. He knows that a corresponding bird flew through the air above his head, while he gazed upon the phantom beneath his feet. He calls it a real bird; but what assurance has he that the kingfisher in the air is any more real than the image in the water? May not it be merely the visible reflection of an invisible reality?

"All this that you call material," said a fanciful friend the

other day, in response to some remark of ours implying the absolute existence of those "permanent possibilities of sensation" known as *things*, "all this is but the fleeting image, the reflection, as in a glass, of the truly real, that is the spiritual, to which we shall some day attain."

Just here, perhaps, in the misapprehension of the phenomena of reflection, we may find the key to the entire scheme of mystical philosophy, and prove it based, not on the refinement of reason, as its disciples fondly imagine, but on an optical blunder. We may possibly find also a sufficient answer to the aspersions which the same school of thinkers are wont to cast on the integrity of our senses.

Sitting at our table, we seem to see at this moment, in the broad window of a shop across the street, the image of a workman repairing the street. By direct vision, we can see neither the man nor the work he is engaged upon. Across the room hangs a mirror; in it appears the reflection of a window, and in the window the reflection of a passing cart. Neither cart nor window is directly visible from where we sit. Using a form of common speech inherited from an unscientific age, we say we see, in the glass and on the window, images of the objects mentioned; but in reality we see nothing of the sort. The cart seen through the double agency of window and mirror is no image of an image, but the cart itself, as positively as though we were looking directly at it. The bending of the light rays in their passage from the objects to our eyes does not affect the message they bear in the least. In the case of the man, the light which brings us information of him is bent or turned back once, in the case of the cart, twice; our vision is indirect, not direct; yet it is absolutely the man and the cart that we see, not images of them. So with the poet's kingfisher. It was the living bird he saw, not a phantom; the seeming under world was really the upper world indirectly seen. In this and all similar cases, the delusion lay in the mind of the mystic, not in the things seen.

Equally so with the Arab philosopher's dreaming. It matters not whether the reflection is at one or a thousand removes; it is the reality which we see. By what means the brain mingles and combines the impressions of sense in dreaming we may not know; but this we know, it always combines and never creates. The man blind from birth sees no visions in his sleep; the man born deaf and mute hears no voices in the dream world.

The alleged untrustworthiness of our senses, we flatly deny. In health, they invariably tell us the truth. We frequently misinterpret the message they bring, it is true, but that is no fault of the senses. The interpretation of sense impressions is something to be learned; we never learn it fully; we are liable to blunder throughout all our days; but that gives us no right to call our senses liars. It is our judgment, not the sense of sight, that is deceived when we stumble, with the mystics, into Alice's "World behind the Looking Glass."

We learn, for example, to associate certain plays of light and color with certain natural gems. When we see the same effect produced by artificial pastes, we mistake them for real gems; but it is not our eyes that cheat us; they simply report the flashing lights, and, through our lack of knowledge, we make an inference not in accordance with fact.

Again, when we see the same play of color, we say it is produced by a gem, natural or artificial,—and it may be neither, but only a bit of glass with tinsel underneath. We discover the imitation, and therefore know that there are three ways of producing that particular play of color, and we estimate the probable one in any case by the attending circumstances.

We witness a spectacular play, and see the actors luminous with—what shall we call them? Not real gems, for they are too numerous; possibly imitation gems, still even they would be too costly; we reason therefore that they must be tinsel-lined glasses. But we are wrong; there are no gems, real or artificial; there are no glass-covered bits of tinsel; they are simply angular cavities of bright metal bathed in colored light.

Did our eyes deceive us? Not at all. They simply told of flashing lights, the mechanism of the flashes being left for the other senses to determine. A child bred in a theater, and used to the phantom gems only, might be as much deceived by real gems as we were by the metallic reflections; but in neither case would the deception lie with the sense of sight. We not only wrong our honest senses but lose our grip upon this most substantial world of ours when we let mistaken metaphysics persuade us to doubt the testimony they bear.

THE KEELY MOTOR DECEPTION.

The value of any known substance as a heat or force generator may be determined and mathematically expressed with the precision of a simple sum in arithmetic. Thus, it has been settled that the combustion of one pound of coal yields a motive force equal to a weight of eleven millions of pounds; if the combustion occupies one minute of time, the pound of coal yields a driving force of over three hundred horse power during that period; if the combustion is spread through an hour's time, we have five horse power from the pound of fuel; while one fifth of a pound of coal, burned per hour, yields one horse power during that period. But our best engines and boilers are so imperfectly made and managed that so much power as this is never, in practice, realized. The best practical results rarely exceed one horse power per hour from 1½ lbs. of coal.

This result, although defective, although indicative of the need of improvements in steam apparatus, is, nevertheless, economical as compared with any other known method of generating power. Reduced to money, with coal at \$5 a ton, the cost for steam power fuel, in Philadelphia, using the best

engines and boilers, is less than three cents per day of ten hours for each horse power.

We think it will be hard for Keely and his assistants to supply motive power any cheaper than this, allowing them the full benefit of the extravagant assertions they set up.

They now aver that they cannot transmit the new "power" under a less pressure than 1,000 lbs., to the square inch, and expect to keep their "receivers" full of their "new cold vapor," at a pressure of 30,000 lbs. per square inch. To manage this pressure will involve expenses that steam power does not require, even though the air and water, out of which the "cold vapor" is manufactured, cost nothing.

But what is the new power, of what is it composed, from what is it generated, how is it prepared, what are the principles involved, what is the nature of the apparatus?

During the past week we have had conversations with Mr. H. C. Sergeant, of this city, who is one of the principals in the Keely motor concern, the chief machinist of the establishment, and one of the four persons to whom only, Mr. Sergeant assures us, the nature and *modus operandi* of the "great secret" has been communicated. Mr. Sergeant has long been known in this city as an able mechanic, and is a gentleman of the highest integrity. He informs us that neither Mr. Keely nor himself have anything to do with the sale of stock shares, but are honestly engaged in the endeavor to reduce the motor to practical working harness. The shares are bought and sold by other persons who have faith, but know nothing whatever of the principles involved or the method of operating the apparatus. This informant states that the official report, from which we made extracts last week, was not intended for publication, and contains statements which more recent experiments have shown to be untenable or unnecessary.

As Mr. Sergeant is a very practical man, we hoped to be able to obtain from him a full history and description of the motor. But he said he preferred to defer the matter until the new apparatus, now nearly finished, has been tried, its results ascertained, and the patents secured. However, he gave us a little preliminary information:

What is the new power? Our informant avers that it is a "cold vapor," an entirely new article, its composition unknown either to Mr. Keely or himself.

From what is it generated? It is generated, our informant states, from air and water, without fuel, heat, chemical action, or the use or consumption of any substance, save air and water.

How is it produced? Mr. Sergeant states that it is produced "purely by mechanical manipulation, which evolves a cold vapor; and by graduating his vaporizer or generator, Mr. Keely is able to produce a pressure of 10,000 to 15,000 lbs. per square inch in a receiver of greater volume than the total contents of the generator, with great rapidity and certainty."

What are the principles involved? The principles are not yet accurately determined, but appear to consist in the communication to the air and water, by mechanical means, of a certain sort of initial vibrations, the resultant whereof is the aforesaid "cold vapor."

What is the general nature of the apparatus employed? A series of simple pipes, nozzles, and check valves. Nothing more.

As to the properties of the "cold vapor," Mr. Sergeant gravely avers that its natural volume is over five hundred thousand times greater than the water from which it is derived; and that by a sudden enlargement of its containing chamber, the vapor suddenly condenses into water again.

These are curious statements, especially when we consider that the elementary gases resulting from the decomposition of a given body of water, H₂O, have a volume of only two thousand times that of the water from which they are obtained.

Our informant states that he has searched the principal fountains of knowledge and consulted the most eminent professors of chemistry, in the hope of ascertaining what the "new vapor" is. But all the oracles of Science are dumb; they are unable to grasp the problem, they afford him no information whatever. We suggest that the new article may be "luminiferous ether," that imponderable substance that fills infinite space and occupies the interstices of the molecules of hydrogen gas and all other bodies. No one has heretofore succeeded in imprisoning this intangible ether, for it passes through glass, metal, and all substances in Nature as if they were so much fog. But then, Mr. Keely, it is alleged, generates an enormous pressure, suddenly, rapidly, with certainty; and perhaps by this means, without knowing it, he compresses several of the atoms of the luminiferous ether into one, before they have time to escape, thus enlarging their size sufficiently to prevent their passage through the molecular spaces in the metallic walls of his generators. But this is merely a suggestion of ours.

Such, in brief, is the latest information we have been able to obtain, from probably the best informed individual connected with the affair. That our informant is laboring under a strange hallucination is most certain. That so able, practical, and excellent a man should, under the pressure of a delusion, become the unwitting assistant of a deception by which hundreds of innocent people are being led to loss of their property, is a matter of profound regret.

In our paper of last week we quoted from an article upon the Keely Motor Deception published the previous year, May, 1874, in which an extract was given from the Keely Company's pamphlet, wherein the names of several well known professional gentlemen were given, by the Keely people, as witnesses and referees to the correctness of the motor performances, and the truth of the statements given in the pamphlet. Among the witnesses so cited by the Keelyites was Wm. W. Wood, Chief of Bureau of Steam Engi-