neering, U. S. N. In view of the following letter, our Keely friends will have to cross out that gentleman's endorsement:

NAVY DEPARTMENT,
Washington, D. C.

To the Editor of the Scientific American:

My attention has been directed to an article in your paper of recent date, relating to the so-called Keely motor.

My name has been mentioned as one of the advocates of the alleged invention without my authority. I know nothing about the construction or operation of the device; and as I am not in the habit of endorsing inventions of which I am ignorant, of course I could not endorse the so-called Keely motor. I am, respectfully, your obedient servant,

June 24, 1875. Wm. W. W. WOOD.

The editor of the *Leader*, of Cleveland, Ohio, has been to Philadelphia, seen with his own eye the Keely gage go up, has become a full convert to the wretched deception, and answers the strictures of the SCIENTIFIC AMERICAN by calling us a scientific ass. Well, it is better to be an honest ass than a blind hack-leader of a deception.

Every perpetual-motionist, for the last generation, has considered us an ass, because we could not recognize his errors as truths, or his deceit as facts. The Ericsson hot air stock-jobbers pronounced on us the same epithet. Paine and his water gas people did the same. So did the Paine electro-motors, of more recent date, and the pendulum motors, and the spirit motors, and now we have it from the cold vapor motors. We candidly admit that it requires but a small amount of intelligence to discern such deceptions, less even than that of the dullest member of the long-eared but useful family to which the *Leader* refers.

Besides the epithet mentioned, the *Leader* gives as a reason for its support of the Keely deception that the SCIENTIFIC AMERICAN is chiefly devoted to the puffing-up of inventions patented through its agency. It is true that a very large portion of all the patents granted for new inventions are obtained through the agency established thirty years ago by the proprietors of this paper. Our experience has undoubtedly been greater in this line than that of any house in the world. But it is equally true that the SCIENTIFIC AMERICAN is an impartial recorder of all interesting or important inventions and discoveries, and that its scientific information is in general reliable and valuable. This is shown by such facts as that, in patent trials in this country, the back volumes of the SCIENTIFIC AMERICAN are constantly produced as authorities upon disputed scientific points; while in the hundreds of libraries and reading rooms, scattered the world over, it will be found that the volumes and files of the SCIENTIFIC AMERICAN are more closely studied, more highly valued, and in greater demand than any other scientific publication extant.

When the editor of the *Leader* recovers from his present Keely delusion, when this attack of new motor epizoötic passes over, he will, we feel confident, think better of the SCIENTIFIC AMERICAN.

We gave in our last number a few brief examples of ways whereby small quantities of "cold vapor" might be readily produced by concentrating water weights upon confined air. On this our friend of the *Leader* argues, in support of the Keely motor, that he could, by simply turning a hydrant pressure of 26 lbs. to the inch into a six-gallon kitchen water boiler, make the water issue from the boiler into a bath tub at a pressure of 240 lbs. to the inch. We will not dispute the hydraulic capabilities of our friend; but we feel confident that no one but an out-and-out disciple of the Keely-motor confederacy could accomplish what he claims, in the way he describes.

THE NATURAL HISTORY OF SWINDLES.

The swindler is perennial, and always busy. His methods vary with time and circumstance, but at bottom he is always the same. And there is, in the permanent propensity of men to be swindled, a never-ending inducement for him to concoct his swindling schemes. He simply furnishes what the public call for.

What is the basis of this irrepressible tendency to be "taken in"? What are the fundamental conditions of its development?

We refer chiefly to the amazing gullability which induces or suffers men—practical men, so called—to honestly enter upon mechanical and financial schemes of enormous promise and certain failure. The swindler has a motive that cannot be mistaken; but what is the motive of the victim? Is it native stupidity, invincible ignorance, eagerness for sudden riches, or what, that makes capitalists, notoriously shy of taking hold of enterprises of real merit, so ready to invest their money in palpable frauds?

There is need of another Darwin to study the genesis of the various species of swindles. Do they follow a consistent law of evolution, and mark successive stages of individual unwisdom and popular incapacity for learning? It would be a curious study—a consumedly interesting study: we fear it would be as humiliating to human pride and disastrous to our theories of popular progress. To say the best, it does take mankind a terrible while to learn anything, by experience or otherwise.

A good deal of light has been cast on many phases of gregarious foolishness—of human sheepishness, as Sir Arthur Helps cleverly characterizes the tendency of men to "go with the crowd," right or wrong—by the study of epidemic delusions, wherein whole communities, often whole nations, have gone mad with some dominant idea, as of witchcraft or the like; but such studies throw little direct light on the philosophy of swindles. Those take possession of crowds; these are limited in their operations to individuals.

Besides, epidemic delusions are always of an emotional character, and have to do primarily with spiritual affairs, though their manifestations and results are often enough grossly physical; while the swindle has always a material object. To use a rough but sufficiently accurate figure, the one usually speculates in corner lots in the New Jerusalem, the other in swamp lots in some wild cat city of the Far West. The one trades on the transmutation of the base metals of human weakness and wickedness into celestial gold by the violation of all social and moral principles; the other on the conversion of common lead into double eagles by some impossible circumvention of the laws of Nature.

In both there is a firm, often intense, belief in the incredible. In both there is a confident expectation of getting a very large something out of nothing, or what is worse than nothing. In both epidemic and individual delusions, too, the victims are often men who, on other subjects, are shrewd, sane, practical.

The social conditions and current beliefs, which prepare the way for the reign of the first, can be clearly made out. Is it possible to do the same for the second? To estimate how far the two rest upon a common basis of misconception as to the conditions of existence, and how far the swindle depends on individual conditions of heredity, environment, want of knowledge, and greed of gain?

We are inclined to think it is quite possible; but we leave it to the future Darwin of this department of natural history to undertake the task. It will be sufficient for us, when time and space permit, to notice a few of the determining conditions which make the trade of the swindler so enticing and remunerative.

RECENT IMPROVEMENTS IN GLASS MANUFACTURE.

The recent discoveries and inventions of M. De la Bastie, in France, in annealing glass, the improvements on his process by Mr. Charles Pieper, of Germany, and the method of hardening glass by Mr. Macintosh, of England, show that, whatever we may know about the chemical constituents of different varieties of glass, its physical properties are still almost a *terra incognita*.

We have been so accustomed to consider fragility as unavoidably connected with the conception of any glass object, that the idea of a glass bottle or goblet which may be knocked about and thrown on the floor, or of a glass pane which will not break when a stone is flung against it, appears an impossibility, if not an absurdity.

At the same time, all well informed persons know that the value of precious gems consists in their hardness, which enables them to keep their polish, while all glass imitations tarnish soon; that the test wherewith to distinguish a gem from a glass imitation is the application of the corner of a steel file, which will scratch glass but not a real gem. If now Mr. Macintosh finds a way to make glass as hard as a diamond, so that powder obtained from such glass can be used in place of diamond dust, what will become of all the comparative degrees of the value of gems? If paste (a soft lead glass imitation of diamond, which very nearly equals the diamond in luster) can be made as hard and as lasting as the genuine gem, what is the difference to the wearer, except that he knows that his ornament cost only $5 or $10 instead of $1,000 or $5,000? We have heard the most eminent jeweler of New York city declare that paste imitations are often so fine that, when worn in the evening, it is impossible to distinguish them from the real article. He confessed that he was unable to decide as to their genuineness unless he were allowed to have the articles in his hands under daylight illumination.

Glass appears, then, to have properties similar to those of steel which relate to hardening and annealing. We may change the temper of a steel tool by heating and slowly cooling, and this is what is done with glass by De la Bastie and Pieper, by the intervention of a proper bath, the chemical nature of which undoubtedly plays an important part. On the other hand, we may make steel hard by suddenly cooling it when very hot, and we may modify the nature of the steel by exposing it to the action of diverse substances, among which carbon is the most important, the influence of the carbon being very powerful, as the addition or abstraction of one half to one fourth per cent of carbon, to or from the steel, results in a great difference in its physical qualities. It is so with glass. Mr. Macintosh, after having pressed the heated glass to the proper shape in iron molds, according to the usual method, transfers it to thin platinum molds, brings it nearly to the fusing point, and then suddenly plunges it into a freezing mixture containing snow, ice water, and salt, or their equivalents, or in some other mixture producing an intense cold, different kinds of glass requiring different mixtures. This latter point is now under investigation, and the results promise to teach us a great deal more about the most remarkable and useful material, without which, as Liebig remarked, our progress in Science could only have been very limited. It is hardly necessary to enumerate our obligations to glass. Without it no telescope nor microscope, no barometer, could have been invented; and no modern astronomy, hardly any chemistry, and but a little physical science would have been possible.

THE PLANETARY ATMOSPHERES.

The most recent researches into the nature of the gaseous envelopes of the planets are embodied in a work lately written by Dr. Vogel, director of the observatory of Bothkamp, Germany, in which the author describes the results obtained by analyzing the light of each planet by the aid of the spectroscope. A previous study with the telluric lines, lines produced in the solar spectrum though the absorption of the terrestrial atmosphere, enabled him to draw comparisons between the latter and the atmosphere of the planets, and to recognize in some instances a similarity.

The principal lines in the spectrum of Mercury coincide absolutely with those of the solar spectrum; and it further appears that certain lines, which are not produced in the latter save when the sun is very low on the horizon, and when the absorption of our atmosphere is very considerable, permanently exist in the Mercurial spectrum. There is, therefore, a gaseous envelope about that planet, the absorption of which is equal to that of the earth's atmosphere at its maximum.

The light emitted by Venus resembles in its essential traits that of the sun, with a few lines added, which may be identified with those of the absorption spectrum of the atmosphere of the earth. Since the modifications of the solar spectrum which can be traced to the planet's atmosphere are very slight, it must be concluded that the majority of the solar rays are almost wholly reflected from the cloud envelope which encompasses the planet. According to Janssen's observations, the telluric lines are due largely to watery vapor, and hence it may be admitted as very probable that the atmosphere of Venus contains water.

A large number of the lines of the solar spectrum are found in the spectrum of Mars. In the less refrangible portions of the latter appear certain bands, which do not belong to the solar spectrum, but which coincide with the terrestrial absorption spectrum. It may from this be concluded with certainty that Mars possesses an atmosphere which does not differ essentially from our own, and which is rich in watery vapor. The red color of the planet is owing to a complete absorption of the blue and violet rays. There appear to be some lines which are peculiar to the planet, but their position has not been definitely fixed, owing to the too feeble luminous intensity.

The majority of lines which distinguish the spectrum of Jupiter coincide with the solar lines. The Jovian spectrum, however, differs from that of the sun in the presence of a few obscure bands in the less refrangible portion, and especially in one band in the red, the length of an undulation of which has been determined to be 2471·5 hundred millionths of an inch. The other lines foreign to the solar spectrum coincide with the telluric lines. The more refrangible blue and violet radiations are uniformly absorbed. The Jovian atmosphere, it is concluded, exercises on the solar rays which traverse it an action analogous to that produced by the earth's atmosphere, whence the presence of the vapor of water in the former may be predicated. It is doubtful whether the band in the red, above mentioned, results from the presence of some special body not found in our atmosphere, or from the fact that the gases encompassing Jupiter are mixed in different proportions from those in air. It is possible, however, that the two atmospheres are similar, but that their actions on the solar rays differ on account of circumstances of temperature and pressure. The spectra of the dark belts, observed on the disk of Jupiter, are characterized by the marked uniform absorption of the blue and violet rays. No new absorption bands appear, but the lines are broader and more marked than elsewhere, proving that the dark belts are deeper than the adjoining regions. The solar light penetrates more profoundly into the atmosphere of the planet at such belts, and hence is submitted to more marked alteration.

The spectrum of Saturn shows the most marked lines of the solar spectrum, and gives bands which, with one exception, coincide with those of the spectrum of our atmosphere. In general, the Saturnian spectrum is closely analogous to that of Jupiter. The spectrum of the ring, however, is very different, and shows no atmosphere, or at most a thin gaseous envelope of feeble density.

The faint light of the spectrum of Uranus does not admit of distinguishing the Fraunhofer lines. Certain bands have been noted, the undulations proceeding from which have been measured, and which without doubt result from the absorption of solar rays in the enveloping atmosphere of the planet. To what bodies such absorption is due, it is impossible to tell. One band, however, corresponds exactly with another found in the spectra of both Jupiter and Saturn. The spectrum of Neptune differs essentially from the solar spectrum and is characterized by a few large absorption bands, generally, it appears, identical with those of Uranus.

Among the small planets, M. Vogel has examined Vesta and Flora, with uncertain results, however, owing to their lack of brilliancy. There appear to be indications of an atmosphere about Vesta.

What Inventions Do.

The following colloquy recently took place between Recorder Hackett and a criminal before him for examination in this city. From it we conclude that, while human depravity is not less prevalent than formerly, modern inventions protect mankind from the depredations of the vicious, by rendering their operations considerably more hazardous:

"What is your business?" asked the Recorder.

"I am obliged to work."

"Don't you like it?"

"No."

"Why not? What was your business?"

"A cracksman." (Frank answer.)

"Well, then, you have given up that business?"

"Yes. You see, Counsellor, what with the burglar alarms in houses and stores, and the district telegraphs, and people growing economical and careful, and the newspapers hounding us, burglary, garotting, and highway robberies, and such things, is actually hazardous, and ain't so easy to be did."

To make waterproof packing paper, dissolve 1·82 lbs. white soap in 1 quart water. In another quart water, dissolve 1·82 ozs. troy of gum arabic and 5·5 ozs. glue. Mix the two solutions, warm them, and soak the paper in the liquid, and pass it between rollers or simply hang it up to drip.