# Sricutific gmuxrian. <br> FSTABLISHED 1845. 

| MUNN \& CO., Editors and Proprietors. |
| :---: |
| NO. Br PARLSHED WEEELYAT |
| O. D. MUNN. |

## TERMS FOR THE SCIENTIFIC AMERICAN.

 One cons, one year, postage included...One cops, six months, postage included same proportionate rate. Postage prepaid.
se Singte copies of any desired number of the SUPPLEMENT sent to one adiress on receipt of 10 cents.

The Scientific American Supplement is a distinct piper from the SCIENTIPIC AMER SCAN. THE SUPPLLE CENT 15 issued weekly. Every number contains 16 uctavo lazes, with handsome
cover. unifurm in sizewith ScIENTIFIC AMERICAN. Terms of subscription for Supplenent, s5. 00 a year, pustage paid, to subscribers. Single copies
10 cents. Sold by all news dealers throughout the country. will be sent for one sear, postage tree on reccipt of seven collars. Bot papers to one address or different addresses, as desired. The sifest way to remit is by draft, postal order. or reglstered letter
Address MUNN © CO. 37 Park Row. N. Y.

Scientific American Export Edition.
The Scievtific Animican Export Edition is a large and splendid per
iodical, issued once a month. Each number contains about one hundred lodical, issued once a month. Each number contains about one hundred
large quarto pages, profusely illustrated. embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the : CliswTFIC
Amenicas, with its splendid engravings and valuabe information: Commerclal, trade, and manufacturing announcements of leading houses Terms for Expart Edition, 85.0 a year, sent prepald to any part of the
world. Singlecopies 50 cents. world. Singlecopies 50 cents. Manufacturers and others who desire
to secure foreign trade may have large, and handsomely displayed an nouncements published in this edition at a very moderate cost.
The ScIEvTIEIC AMP: lation in all commercial places throuFhout the world. Address MUNS
CO.. 87 Park Row, New York.

VOL. XL., No. 10. [New Series.] Thirty-fourth Fear. NEW YORK, SATURDAY, MARCH 8, 1879.


## TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT NO. $166^{6}$



## GARY'S MOTOR

He who credits the statements concerning Gary's motor containcd in an article in the March number of Harper's Magazine, can readily believe in the wonders of that division of China where the rivers run up the mountains, the moon outshines the sun, and the cats have the power of clephants. He can, moreover, add to this belief a feeling of utter con tempt for scientific men. Faraday, Rumford, Joulc, and Helmholtz have lived in vain. Their work can be demol ished by the simplest use of tenpenny nails and a few mag. ets combined with the use of a piece of shect iron.
It would be difficult to find such utter ignorance of the first priuciples of science as is containcd in this article on Gary's motor; it encourages men to spend time and money in fruitless effort, and at the same time to despise all training. The allegation is made that scientitic men arc slower than the general public to acknowledge a new step in ad vance; and the discovery of the neutral line, the principle of Mr. Gary's motor, togcther with the ncar possibilities of the grand discovery, are affirmed in an e.r cathedra manne by one whose own statements show that he has no knowledge of the subject of which he speaks.

Mr. Gary's discovery of the ncutral line is not a discovery There is no neutral line in the sense that the polarity changes when Mr. Gary moves his piecc of sheet iron with its at tached shingle nail across the pole or near the pole of a mag nct. The most delicate instruments fail to detect such change of polarity. Mr. Gary is perfectly right in his description of the behavior of the nail: at a certain point it leaves the sheet iron and falls to the ground, simply because by reason of its approach to the attracting pole, it tends to fly to it; but in lcaving the picce of shect roon. the force of gravitation acts more strongly than the force of attraction of the pole of the magnet, and the nail consequently falls to the ground. It is well known that the force of magnetic at traction decreases very rapidly with the distance. $\Lambda$ small nail can fall across the pole of a very strong magnet within a quarter of an inch of the pole, and yet the force of gravita tion asserts its stronger claim and the nail will not bediverted to the magnet. It will be noticed that Mr. Gary's models, which are figured in the article in Harper, are so arranged as to take advantage of the attracting force of gravitation. Hold a horseshoe magnet in a vertical position, and move a piece of shect iron with an at tached nail to and from the poles of the magnet. It will be found that there is no neutral line where the nail drops off. Vary the experiment by substituting an iron wire for the piece of shect iron, and with an attached nail explore the space in front and beside the poles, and it will
 be found the pols

## Tn

 be found that the nail show along the wire or shect iron, Slip a small coil of wire along the wire or shect iron, and convect its terminals witha delicate galvanometer; if there is any change of polarity, the galvanometer needle should be diverted first in one direction, then in another, as you move the sheet iron or the wire away from complete contact with the poles; no such change of deviation will be perceived.
In Fig. 2 the magnets are set in motion by vibrating, with the aid of a lever, a picce of sheet iron, so that it may " move

## Fin.


on the neutral line," as the writer in Harper expresses it. This acts as a cut-off, and one of the two opposing horsesho magnets drops from its former position, where it was held by mutual attraction. Let us sec what is the cause of this action. Place ahorseshoe magnet on the table, and bring a compass needle directly in front of one of the poles of the horseshoe magnet. The compass needle will be strongly at tracted to the neighboring pole. Now bring a thin piece of iron in front of the poles of the horseshoe magnet and be tween them and the compass needle; the latter will immediately dip, and will have its attraction for the pole of the horseshoe magnet diminished, not because the shect iron act as a cut-off for marrnetism, but because the poles formed by induction in the thin shect iron are nearer the end of the compass needle, and accordingly exert their influence. Here we see again the effect of proximity. Magnetic action acts through very short distances, and the nearest magnctic mass exerts more influence than a remoter one, which may nevertheless be the stronger magnetic body. Mr. Gary experi ments with a box compass. The indications obtained in this way are apt to be very misleading, and the use of such method was abandoned by scientific men more than fort years ago. The friends of the new magnetic motor have only to consult the experiments of Jamin, of Dub, and a host of others to discover that what are claimed to be new facts hav tion and redistribution of magnetism caused by armatures to magnets and the presence of iron in the neighborhood of magnets. Abundance of time and patience to look up the subject will be needed, for the literature of the subject is immense.
these well known facts; for it may be said, "Explain the ncutral line as you may, there is still an important applica tion of the forec of magnetism in the invention of Mr. Gary." It is said that this little motor requires a careful adjustment of the finc pivots upon which the movable magnet turns, and particles of dust are sufficient to bring it to rest. The excur sions of the so-called cut-off are limited to the one twenticth or one thirtieth of an inch, and a fine aldjustment is also needed here. This is the motor which is to produce the electric light and to drive locomotives across the continent The line of argument of the inventor's friends is very strik ing, and deserves notice. In the article in $I I_{\text {(rpper', which }}$ we have taken as our text, the writer says: "To gain a larg amount of power the inventor would place groups of com pound stationary magnets above and below the beam at each side, and the soft iron induced marnets, in this case foar in number, connected by rods passing down between the poles of the stationary magnets. $\Lambda$ 'pitman'connecting the beam with a flywhee to change the reciprocating into a rotary mo tion would be the means of transmitting the power. With magnets of great size an enormous power, he claims, could be obtained in this way."

This is the old, old fallacy; and is always stated in this way: " $\Lambda$ small magnetic motor will run and produce comparatively greal result, a large one will necessarily give a corresponding increase of power." This is not tue; there is a limit beyond which one camot pass. One can see this ven in magnetizins pieces of steel of various sizes and in the construction of dynamo-clectric machines. In werad in the use of Mr. Gary's motor in producing the electric light we have no hesitation in pronouncing upon its utter incom petency for such a purpose. It is in the discussion of the possibilitics of the new motor that the writer in Iferper is most eloquent, and we do not know which to wonder at most the exuberance of his imagination, his moml courage in the contempt of the authority of science, or the nailivete of his utter ignorance. He says, speaking of the electric light Which is produced by this motor: 'An enormous volume can be secured with an expenditure of fore so diminutive that a caged squirrel might furnish it. With the employ ment of one of the smallest of the magnctic motors, power may be supplied and electricity generated at no expense beyond the cost of the machine." This statement require no comment. The writer further says: "Professors from Harvard and from the Massachusetts Institute of Technology called, examined, and were impressed." It is true that only one professor from Harvard called, examined, and was no impressed; for the motor had just heen taken to pieces and was not in a condition to run; moreover the professor docs not believe that it will run except for a short space of time The only way that it could run would be by weakening it or using up the potential energy of the permanent mag nets, and allowing the earth's magnetism to replace it If such a toy could be made it would have great scientific interest; it would not contain the ide: of perpetual motion, for it would be the emplorment of the magnetism of the earth, just as we employ the force of the winds. We should be delighted if Mr. Gary has done this; and a scientific reputation would be within his grasp. There is no evidence, however, that he has really made such a toy. We bave called it a toy; for as a motor it could not do any apprecia ble amount of work except in a romance of Jules Verne.

## senate patent bill No. 300.-Shall it pass the

 HOUSE OF REPRESENTATIVES?The term of the pre:ient Congress is rapidly drawing to a close, and little time is left for the friends of industrial progress and the rights of inventors to express their dis approbation of the olmoxious clauses of the new Patent Bill (Senate Bill 300).
We are informed, by parties whose knowledge and in egrity cannot be questioned, that the concerted plan of the promoters of the bill is to allow no further discussion fit, but to await a favorable moment for their scheme, and rush it through during the last days of the session in the burry and excitement preceding adjournment-a period noted for hasty and ill-considered legislation.
We are confident that, were time enough allowed for all the members to become thoroughly informed in regard to the mischievous tendency of several of its provisions the bill would be overwhelmingly defeated; but there would seem to be no time for that now. It is too late for extended arguments against the impolicy of crippling and discourag. ng the class of men who (as all parties acknowledge) have been and are one of the great motive forces of national rogress : too late for elaborate protests against the threat encd invasion of the constitutional rights of inventors, and the disorganization of our industrics by the legalizing of infringements.
But it is not too late, we trust, for an efiective expres sion of popular disfavor-by telegraph. Disregarding the slow formalitics of memorials and like communications by mail, all who regard the inventor as more worthy of encouragement and protection than the infringer, should promptly avail themselves of the means which invention has provided for such emergencies, and telegraph their disapproval of Senate Bill 300. No member not alread known to be opposed to the bill should be left a moment in doubt as to the feeling of his constituents. The changes which the bill would make in the spirit and the ruling of the patent system, should it become a law, are fatal; and no surer means could be devised for preventing its passage than an electric expression of popular will against it

Hitherto the inventor has enjoyed, so far as the courts could secure it, the exclusive control of his invention which the Constitution guarantecs. His patent has been regarded in the courts as presumptive evidence that his claim to the invention covered was a just claim. Under the proposed amendments of the law, all this will be reversed. The patentec's right will be burdened by needless penalties in the shape of heavy fees, and laid open to invasion by any one who chooses to infringe it. And when his case is brought into court the inventor, not the infringer, will be treated as the culprit.

Every inventor feels that the bill is aimed against him; and should it become a law, we fear that there will result a dis astrous fultilment of the prediction of a hard-working and hitherto succe-sful inventor, who says:
"One thing I have decided upon. If the law is changed, so as to lessen my rights as an inventor, I am through, I quit the field, and thousands of others will be compelled to do the same."
The country cannot afford to have such men quit the field. Pulicy, as well as justice, forbids any measure tending to compel them to quit the ficld; and the members of the lower house should not be left to enact the proposed wrong unwarned.
Let every citizen, who has the great question of justice and wise policy at heart, use the telegraph freely, and en courage his friends to do likewise. The cost will not be great, while the good that maly be done in preventing hasty or underhanded action may be enormous.
In case our suggestion arrives too late, or the telegraphed aldvice fails to stay the passage of the bill, then by the same means the popular will might be brought to bear directly and successfully upon the President. In either case use the telegraph.

## the sa wyer-man electric light.

It will be remembered that in our issue of December 7th, 18,8, we gave illustrations of this novel and promising form heeren busy with endeavors to perfect the invention, and on the evening of February 20 a public exhibition of the light was given in this city by the Dynamo-Electric Light Co. Several improvements in details of construction have been made, but no radical changes. The chicf improvement is in the bearing of the upper carbon holder, to allow for expansion; the lamp has also been made slightly taller. The light exhibited was soft, pure, and steady, and susceptible of perfect regulation. Any lamp in the circuit could be turned up or down, from a dull glow to brilliant incandescence without affecting the rest. An important improve ment has also been made in the switch.
The dynamo machine used was about half the size of the one previously employed; there were more lights in the cir cuit, and the illumination was more brilliant and satisfac-
tory. Comparison was made with gas light, and also with the voltaic arc, clearly demonstrating the superiority of light by electric incindescence for ordinary uses. The carbons used in the Sawyer-Man lamp are now proved to be compa-
ratively indestructible. If, however, the lamp should be broken or estructible. If, however, the lamp should bo and cheaply removed ind repaired as an ordinary gas-burner As regards conomy, tests upon a large scale have not yet been feasible. With the power at command the indications are that the production of light by this system will range
betweco one-flfth and one-half the cost of gals, betweev one-tIfth and one-half the cost of gas.

## a new form of carbon.

In describing the Sawyer-Man electric light, last Decemher, mention was made of the peculiar carbons employed, the mamer of their production being a secret which Mr. Sawjer did not choose at that time to disclose.
We have now been favored with an extibition of the pro. cess, and a very pretty experiment it makes. The carbons in question are about half an inch long, with the diameter of one-sixtecoth of an inch. Their color is stecl-gray, and the surf:ace is hard as steel; within the carloon is tolerably soft. In his carlier experiments Mr. Siwyer employed as the source of inc:undescence slender pencils of gas retort carbon in an at mosphere of illuminating gas. The carbons were slowly destroyed, but at the sance time they took on a superficial deposit, evidently of carbon, but unlike in luster and hardness any carbon that Mr. Sawyer had seen. Inferring that a more rapid deposit would he made in a denser hydrocarbon, Mr. Sawyer experimented with a great variety of such liquids, finding olive oil most satisfactory. His method is simply to heat the carbon to an extremely high temperature, by passing through it an clectric current, while it is immersed in the oil. The best results are obtained by the use of a pencil of willow charcoill, upon which an intensely hard deposit of carbon rapidly forms as the hydrocarbon is decomposed by the heated pencil.

## Life Saving Mattresses.

The Navy Department has been experimenting with a mattress designed for use on vessels at sca, with results said to be favorable. The mattress is filled with cotton, but the process of preparation to which the cotton has been subjected makes it impervious to water for many hours, and renders it capable of sustaining aheavy weight-that of a man without any difficulty. It possesses other propertics which, it is claimed, make it a most comfortable bed; the cotton being frec from all oils and impurities, not lia
and proof a gainst vermin of every kind.
the gary magnetic-motor deception. In the latter part of November last the New York Times
rinted a column letter from Boston describing, as a fact accomplished, a magnetic motor which was to supersed steam; a contrivance which produced motion "by no external agency, simply from the magnetic power of the machine." It was a great discovery, sure to revolutionize the world. There was a lot of talk about polarity, magnetism, "the neutral line," and the usual story of humble genius upsetting all the established laws of science. The inventor had not bcen a student; knew nothing of philosophy from the books; " had I studied or read books," he said, "I should never have experimented, as the books told that what I was
after was an impossibility, that there was no such thing;" but he kept on-and got it!
The world is too full of perpetual motion mongers to justify the Scientific American in noticing them until they become obtrusive. Toward the middle of December, the Times gave another lift to the deception. This time the Gary Magnetic-Motor was about to startle the world by producing the electric light out of-nothing. In the words of the writer: "By the simplest of devices, which he ex hibited to me to-day, Mr. Gary utilizes his own newly dis. covered principle in such a way as to generate electricity for the light at absolutely no expense beyond the cost of the machine, which itself is automatic." A fter listening to a pretended description of the working of the machinc, the Times writer remarked to Mr. Gary: "Your new invention, then, is simply a practical iupplication of the principle, which you have discovered, of the existence of the neutral line, at the
point of the magnetic field where the polarity changes, and which is antagonistic to the heretofore universally accepted theory that magnetism is a static force?"

Precisely," was the reply. "It is only on this principle that the thing is possible.
In its March issue, Harper's Montlly Magazine comes to the aid of the Times, by printing without comment, as a regular article, a long and cleverly written account of "Gary's Magnctic Motor," with several illustrations, which will be found on another page in this issuc of the Scientific american.
We may be mistaken, but the internal cvidence is extremey strong that the same hand that wrote the first (possibly also the second) Times article, also wrote the account in Harper's. It was shrewdly done; and the manifest attempt to insinuate more than his words really implied, in regard to the quesi-indorsement of the machine by scientific men, raises the suspicion that the writer may not have been so thoroughly deluded as he seems. Be that as it may, Tme Scientific American is in position to say that the assertions in regard to the exhibition of the Gary motor in motion by self-yencrated force are not truc; that the assertion that "prof essors from Hirvard and from the Massachusetts Institutc of Technology cilled, examined, and were impressed ' is not truc; that apparitus constructed according to the drawings in Harper's will not do what the writer says they will do; in short, that the pretended motor is a deception, to be classed with the Keeley motor and like contrivances. It is very much to be regretted that the editors of periodi cals so worthy of estecm as the New York Times and Har per's Magazine should give place to such assertions, unsup. ported by the most positive, competent, and conclusive evidence.
The world is full of snares for capitalists, always prompt to snatch at delusive promises of sudden profit; and the fact that the pretensions of the Gary motor have been accepted without a question by a magazinc like IIarper's may be the means of inducing many to put moncy into projects that are sure to result in disappointment and loss.

## the preservation of forests.

In an article with the above title in the North American Revico, Felix L. Oswald, after reviewing the disastrous effects which have followed the wholesale destruction of forests in various countries of the world, remarks that since the year 1835 the forest area of the western hemisphere has decreased at the average yearly rate of $7,600,000$ acres, or about 11,400 square miles; in the Cnited States alone this rate has ad-
vanced from 1,600 square miles in 1835 to 7000 in 1855 and 8,400 in 1876 . Between 1750 and 1835 the total agre gate of forests felled in South and Central America (especially in Southeastern Mexico), and in the Eastern, Southeastern, and Southwestern States of our republic, may be estimated at from $45,000,000$ to $50,000,000$ acres. In other words, we have been wasting the moisture supply of the American soil at the average ratio of seven per cent for each quarter of a century during the last one hundred and twentyfive years, and are now fast approaching the limit beyond which any further decrease will affect the climatic phe nomena of the entire continent.
If we consider how the agricultural products of the eastern continents become from year to year more inadequate to the wants of their still growing population, we may foresec the time when the hope of the world will depend on the productiveness of the American soil; but that productiveness depends on the fertilizing influence of the Americin forests. If they are gone we shall have on earth no newer world to
hope for-no future Columbus can alleviate the struggle for existence. To stay such a catastrophe the author suggests that in every township, where the disappearance of arboreal vegetation begins to affect the perennial springs and water courses or the fertility of the fields, a space of say 50 acres should be appropriated for a "township grove," an oasis to
be consecrated for ever to shade trees, birds' nests, picnics and playing children. In all new settlements, where a rem nant of the primeval forests has survived. let the woods on the upper ridges or on the summit of isolated hills be spared by mutual agreement of the proprictors. In the treeless re gions of the great West not only amateir societics, but every grange and farmers' union of cvery county, should devote themsclves to the work of tree culture; and every landed proprictor should see to it that the boundarics of his estates be set with shade trees, and that wooden fences be sup planted by quickset hedges. Let fruit trees be planted wherever there is a piece of ground neither otherwise occu pied nor absolutely barren; and be sure that their influence on the atmosphere in summer and their fertilizing leaves in fall will more than indemnify the adjoining fields for the modicum of sunlight they may intercept. Any State where these precautions should be generally adopted, would soon be so unmistakably distinguished by the unfailing humidity and freshness of its tields and the abundance of its crops that the sheer necessity of competition would induce back ward ncighbors to try the same experiment; and before long the maxim would not only be gencrally recognized, but gencrally acted upon, that husbandry and tree culture are inseparable.

## the trouble with wire binders.

So far as their utility at harvest time is concerned the self-bivding machines cover oue of the greatest improve ments of the time. Their immediate money advantage is estimated as high as 20 cents on each bushel of wheat grown. The presence of bits of wire in the wheat when it reaches the mill is, however, a serious offset to the gain by automatic binding. The wire injures the stones, is liable to strike fire and explode the mill, cuts the bolting cloths, and is otherwise so nischievous that many millers have pro tested against wirc bindings, and threaten to retaliate with special charges for grinding wire bound wheat.
It has been the practice of farmers to run wire and all through the thrishing machines. So long as the wire is bright and tough no harm is done; but if the wire is rusted and brittle, fragments remain with the grain, and serious trouble may result.
The conditions seem to call for a new invention, an attachment to the thrashing machine which shall cut the wire binding and remove it while the straw passes on to the thrasher. The work of removing the wire would seem to be nowhere near so difficult as the original task of putting it on the sheaf. If rusted wire cannot be entircly removed befor thrashing, it would seem to be quite feasible to separate the bits of iron that remain in the wheat by a train of magnets in the cleaner. In either case we are sure that our inventors can overcome the difficulty by some cheaper means than the abandonment of automatic binders.

## THE WASTE OF FIRE.

During the past year, without the occurrence of any re markable fires, it has cost the United States about $\$ 200,000$ a day to furnish employment to our town and city fire departments. What the fire departments cost we do not know; it is a good round sumat the least calculation. Architects say that 10 or 15 per cent of the cost of any building, properly expended, will make it practically fireproof. Our daily fire losses would therefore fireproof from $\$ 1,000,000$ to $\$ 2,000,000$ worth of new structures a day, or upwards of $\$ 300,000,000$ worth a year. At this rate it would not take many years to reduce the daily fire losses to comparative insignificance.
It might not be a bad thing to forbid in towns and citics the crection of houses upon which less than 5 per cent of the total cost should be devoted to approved plans for prevent ing the spreid of firc. In view also of the increased indifference to fire risks incident to firc insurance, it might be good policy to require that, for every dollar spent for insur ance, a proportional sum should be expended upon means for preventing fires, or upon appliances for securing the prompt extinction of such as might be started. If prevent ve measures were thus made imperative for a decade or so the country would soon be able to save a considerable por-
tion of the $\$ 100,000,000$ a year now directly or indirectly tion of the $\$ 100,000,000$ a year now directly or indirectly ing account of.

Neptune Favors Eads.
The opponents of Capt. Eads' jetty system at the mouth of the Mississippi used to threaten all sorts of disaster to that work by storms. There are indications now that storms may in reality act as an efficient co-operator and ally to Eads. During the severe storms of January a ridge of sand was raised some fect above high water mark, and half a mile long, across the jetties at an angle of $45^{\circ}$, about 100 yards back of the wing dams. Though broken in two by the jettics the ridge continues throughout of the same height and thickness. Captain Brown, who has charge of the works at Eadsport, says if the ridge remains as at present the triangles formed by it on cither side of the jetties-the one being acute and the other obtuse-will cventually fill up with sand, and thus the jetties be greatly strengthened.

A correspondent, writing from Guilford, Conn., protests against the classification of the oriole among mischievous irds. He says that he has frequently seen them tear open apple worms and derour them, and thinks that ought to be fostered rather than destroyed.

