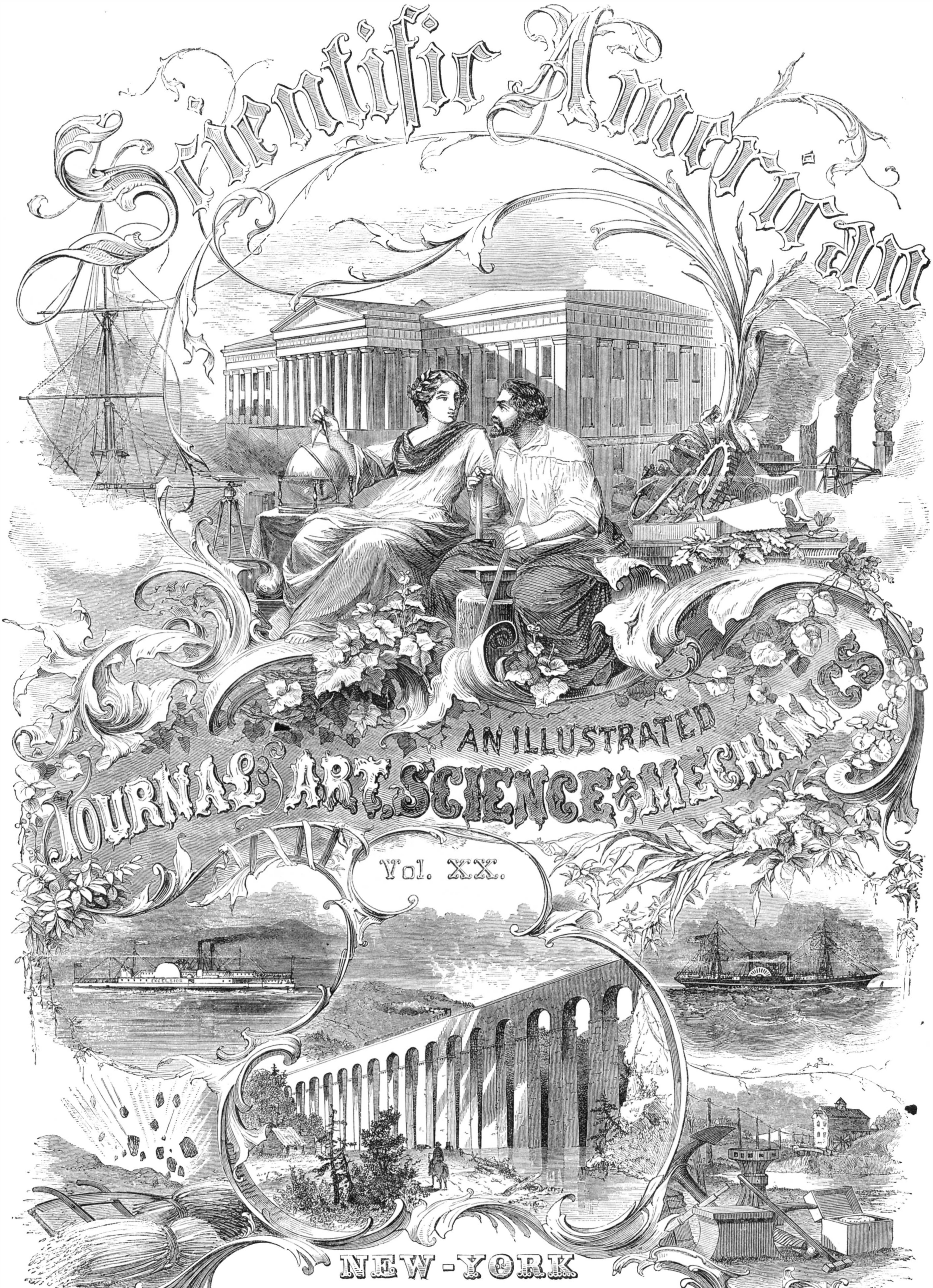

Scientific American
AN ILLUSTRATED
JOURNAL OF ART, SCIENCE & MECHANICS
Vol. XX.
NEW-YORK
PUBLISHED BY MUNN & CO.

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES

Vol. XX.---No. 1. [NEW SERIES.] NEW YORK, JANUARY 1, 1869. $3 per Annum [IN ADVANCE.]

Improved Device for Measuring Power in Transmission.

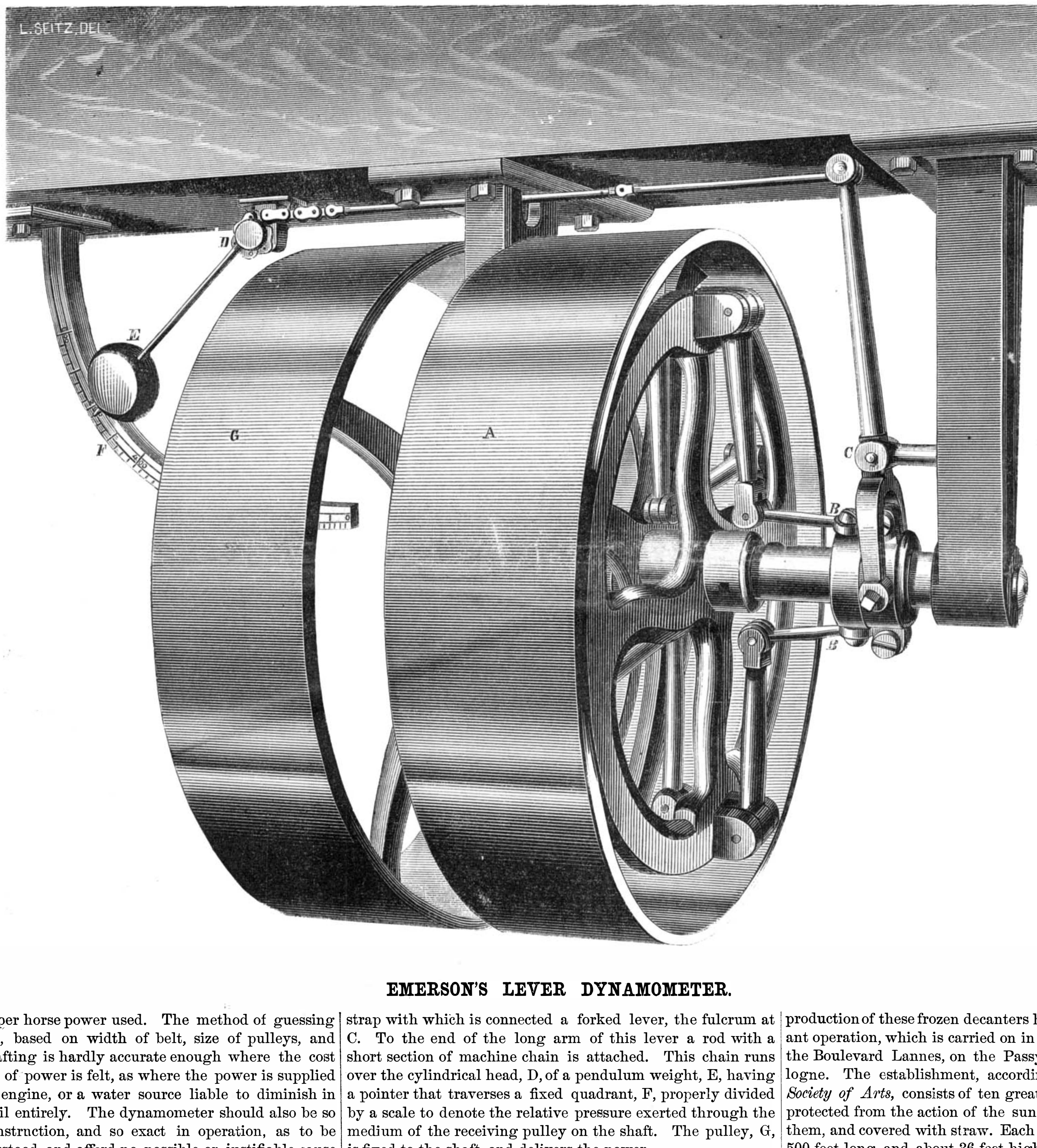
The advantages of a reliable dynamometer have several times been commented upon in our columns—something that would show the amount of power transmitted at all times and under all circumstances. When the object is merely to ascertain the amount absorbed or required by a single machine, a series of machines, or a line of shafting, or the necessary means of transmitting power, a temporary attachment of the power measurer will be sufficient; but there are cases where a permanent attachment of the device is desirable. Such are all cases where the users of mechanical power are hirers, and pay so much per horse power used. The method of guessing or averaging, based on width of belt, size of pulleys, and weight of shafting is hardly accurate enough where the cost of production of power is felt, as where the power is supplied from a steam engine, or a water source liable to diminish in amount, or fail entirely. The dynamometer should also be so simple in construction, and so exact in operation, as to be readily understood, and afford no possible or justifiable cause for controversy between hirer and letter of power. Such is the design of the device herewith illustrated. We have seen several of them in use, and from inquiry have ascertained that their performance was satisfactory to both parties. This fact speaks loudly in favor of the machine.

It is very simple in construction, and direct in operation. The pulley, A, is loose on the shaft, and receives the power. Its connection with the shaft is made by means of a wheel, keyed or screwed firmly to the shaft in close contiguity with the receiving pulley, its hub, in fact, forming one of the guides to the position of the pulley on the shaft. To connect this fixed wheel with the loose receiving pulley, a bell crank lever is pivoted into projecting ears on the rim of the fixed wheel on opposite sides, the long arm of which connects with an annular slotted collar on the shaft by means of the short bars, B. The short arms of the bell crank levers connect on the inside of the fixed wheel with two radial bars, one parallel to the outer arm of the bell crank, and the other at right angles to it, receiving near its upper end a pivot passing through a swivel hung to the rim of the fixed wheel, and having its extreme end pivoted to a stud fixed on the inner side of the rim of the receiving pulley. It will be seen from this description that the strain of the power received through the belt on A, will necessarily react on the levers, and, through them, on the fixed wheel, which may be considered nothing more nor less than a support to these levers in sustaining them in position to connect the loose receiving pulley with the shaft.

At B it will be seen the levers are connected by pivots with the sliding collar, in the annular groove of which is seated a strap with which is connected a forked lever, the fulcrum at C. To the end of the long arm of this lever a rod with a short section of machine chain is attached. This chain runs over the cylindrical head, D, of a pendulum weight, E, having a pointer that traverses a fixed quadrant, F, properly divided by a scale to denote the relative pressure exerted through the medium of the receiving pulley on the shaft. The pulley, G, is fixed to the shaft, and delivers the power.

With this description of the parts, and an examination of the engraving, any of our readers may understand the operation of the device. It will be seen that all the motions are absolute, there being no chance for play and "backlash," except that of joints and pivots; and this, by good workmanship, can be reduced to the minimum—too little to be taken into consideration practically. There is no dependence upon springs, spiral, or other forms, which are so liable to be affected by changes of temperature, and so unreliable between extremes of demand. It is a weighing machine as correct in principle as the old fashioned steel yards or the platform scales; in fact, it is simply a rotary platform scale, and each machine is weighed and tested in place by hanging to the pulley, A, sealed weights, and marking the index as each weight is added. The length of the connecting bars and chain are adjustable. The machine is made of sizes, and in different styles suitable for testing all kinds of machinery. One kind especially adapted for spinning frames, looms, etc.; another to be connected by belt to a line of shafting, or any kind of machine. And one especially adapted for testing turbine water wheels, to which it is easily applied, with but comparative small expense.

Patented by James Emerson, July 7, 1868; whom address for further particulars at Lowell, Mass., Postoffice box, 582.



EMERSON'S LEVER DYNAMOMETER.

Supply of Iced Water to Paris.

Every one who has visited the cafés of Paris must have observed the *carrafes crappees*, that is to say, water-bottles with a great block of ice, often very curiously crystallized inside. The production of these frozen decanters has become a very important operation, which is carried on in the ice-houses situated in the Boulevard Lannes, on the Passy side of the Bois de Boulogne. The establishment, according to the *Journal of the Society of Arts*, consists of ten great underground ice-vaults, protected from the action of the sun by buildings raised over them, and covered with straw. Each of the ice vaults is nearly 500 feet long, and about 36 feet high, and the ten are capable of holding 10,000 tuns of ice. The department in which the water bottles are frozen is a curiosity. These decanters are two-thirds filled with filtered water in the receptacles of the freezing machine, and the freezing is produced by means of salt water and vaporized ether, with the help of a steam engine of sixteen-horse power. When the water within the decanters is reduced below freezing point, it is rapidly stirred with a stick, when the freezing takes place as if by magic. More than 6,000 of these frozen *carrafes* are sent out daily in hot weather, at a very trifling charge, and each being filled up with fresh water as often as required, will serve during a long summer day, and cool ten gallons of water.—*American Gas Light Journal.*

STEEL hammered when "black hot" may be condensed in its substance to a spring temper, but for subsequent tempering it should not be hammered after the glow has departed.

THE COTTON MANUFACTURE IN THE SOUTH.

In a recent article we proffered some advice to the South, as to the proper course to pursue in the reconstruction of her industries. In that article we recognized the possibility that some of the industries which under the old system of things were prosperous, could not under the existing state of affairs be profitably restored, and suggested the substitution of others. Since that article was published a correspondent has called our attention to the feasibility of cotton manufacturing in the southern states, and as evidence of the correctness of his views, has furnished us with some interesting details of the Augusta (Georgia) Manufacturing Company, as shown in the report of its President, for the first six months of the present year. Mr. Wm. E. Jackson, the President, says in his report:

In presenting my twentieth semi-annual report it is with pleasure I can state the condition of the company is very favorable.

The gross earnings for past six months have been		$135,510 65
Interest received		3,921 65
		$139,432 30
From which is deducted expense account	$8,731 64	
Repairs account	3,475 11	
Taxes paid	19,691 41	
		$31,898 16
Leaving as net profits		$107,534 14

From which two dividends of five per cent each; amounting to $60,000 have been paid, enabling us to carry to the credit of profit and loss account $47,534·14, making the amount now to to the credit of that account, $224,798·22.

Goods manufactured from December 14, 1867 to June 13, 1868:

	lbs.	Pieces.	Yards.
4-4	707,018	54,139	2,135,418
7-8	363,801	33,475	1,324,691
Drills	60,685	4,589	178,143
3-4	53,341	6,145	250,049
	1,184,845	98,348	3,888,301

Bales goods on hand December 14, 1867:

	7-8	4-4	Drills.	3-4	Total.
	19	47	6	0	72
Made	1574	2567	254	294	4689
	1593	2614	260	294	4761
Sold	1558	2561	253	270	4642
On hand	35	53	7	24	119

	lbs.
Cotton consumed	1,362,571
Average cost of cotton	19·98
Average yds. per loom, per day	49·13
Average number of looms running	505
Average number of hands employed	507
Aggregate wages paid	$87,546·93
Aggregate sales	$519,965·01

The operations of the company for the past three years, or since the close of the war; viz., from June, 1865, to June 13th 1868, have been as follows:

Nominal balance 17th June, 1865,			$562,583 09
Amount paid creditors due them in Confederate notes,			35,775 22
			$598,358 31
Deduct depreciation in Hamburg and Columbia Railroad stock		$26,625 00	
Deduct depreciation in various assets,		446,284 05	
Deduct suspense account St. Louis,		4,703 71	—477,612 76
True balance, profit and loss account, 17th June, 1865, in United States currency,			100,745 55
Gross earnings from 17th June, 1865, to 13th June, 1868,		932,906 57	
Expense account,	$78,300 61		
Repairs,	33,386 72		
Taxes,	244,479 81		
New machinery,	92,686 76		
Dividends paid,	360,000 00	- 808,853 90	
Add to profit and loss account,			124,052 67
			$224,798 22

Bales goods made	23,545
Aggregate sales	$3,765,301·80
Aggregate wages paid	$622,280·15
Average yards per loom per day	45·9
Average number of hands employed	578

Production for three years:

	Pounds.	Pieces.	Yards.
4-4	3,726,014	292,540	11,337,660
7-8	2,120,137	200,154	7,711,451
Drills	362,173	28,275	1,065,759
3-4	53,341	6,145	250,049
	6,261,665	527,114	20,364,919

It may not be uninteresting to some of our present stockholders to state what has been accomplished in the past ten years. It will be remembered by those who were among the original purchasers, that the property was purchased of the city for $140,000 on ten years' credit, with interest at seven per cent, payable semi-annually, and one tenth of the principal annually, the purchasers paying in as commercial capital $60,000. This amount, in consequence of the dilapidated condition of the property, was almost entirely expended in the first two years, in repairs rendered necessary by the then condition of the property. We have, since the purchase, paid for the entire property without calling on the stockholders for another dollar; added largely to the property by purchase and building, bought about $100,000 worth of new machinery, increased the capital to $600,000 by the addition of a portion of the surplus; paid dividends regularly, and have now a property worth the par value ($600,000 in gold).

Our correspondent, who writes us from Nashville, Tenn., says;

Should you wonder how it is, that the people of the South (who are usually supposed to be quite ignorant in regard to manufacturing knowledge) could succeed so well in making so profitable a matter of a cotton mill, I can readily solve the mystery. In the first place, owing to the mildness and salubrity of our climate, equally free from the intense cold of winter, or the extreme heat of the further South, added to the unbounded fertility of our soil, we produce provisions of all kinds, not only the bare necessaries of life, but as well many of the luxuries at the lowest possible cost of capital or labor—here we have cheap labor and especially of that class (I mean the youth) who are most needed as operators in cotton manufacturing—and this class of labor too, is quite abundant, as there have been but very slight drafts as yet made on it. Beside cheap labor and cheap means of living, we have a great abundance of very cheap fuel of all sorts—wood, away from the cities or large towns at a merely nominal cost—with a supply of bituminous coal enough to run every steam engine on the continent for centuries.

And again, we have the raw material (cotton) right at the doors of the mills that fabricate it into cloth, saving the enormous cost of transporting it to Lowell or Manchester, and re-transporting its manufactured product back again.

If you will estimate this item alone, and suppose for argument sake (for it is not otherwise supposable) that the labor employed in converting it into cloth is as great as it is in New England, you will at once see that it allows as much profit as any reasonably avaricious man should desire.

Our correspondent assures us that the above is not an isolated case, and there are plenty of others which although their business has not been so extended, have achieved equal success in proportion to their investments. He says all that is needed to develop the resources he has enumerated is capital. The capital of Tennessee as of the other slaveholding states in past times, consisted largely in their slaves. This is lost to the South, and until it is in some way replaced in part at least, manufacturing growth must be inevitably retarded.

He states that clever, honest, industrious people will be welcomed to Tennessee, and their personal safety, and that of their property, willbe as assured there as in the North.

The journal from which we have copied the above extract challenges a comparison of the report of the Augusta Cotton Manufacturing Co., with that of any similar establishment in the Northern States, and thinks the cotton manufactures of New England had better look to their laurels.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Propulsion and Dynamical Levers.

MESSRS. EDITORS:—The prevailing opinion among engineers, and, in fact, with scientific men generally, is, that no power can be saved or gained by use of a lever. While this is absolutely true, as relates to the use of the statical lever, it is radically wrong and a very great fallacy as relates to dynamical levers, as will be seen by the following argument.

Under the head of statical levers are included the common scales, the pulleys, the wheels of fixed machinery, and every other kind of levers where the axis is fixed and stationary.

Dynamical levers are those where the supposed axis is not fixed or stationary, but actually the point and line of motion; and under this head are included the wheels of any vehicle, the oar, the legs of all animal and insect organisms, the wings of a bird, the fins of a fish, the duck's foot, and, in short, the one vital principle of the propulsion of all animate and much of inanimate nature is the dynamical lever.

Let us inquire whether or no anything is gained by this kind of lever. Now, it is a solid fact, that a horse can pull a tun weight on wheels, at a speed of two or three miles per hour; whereas, if the tun weight were not on wheels, he could scarcely move it at all. Why is this? The general answer given is, because the wheel overcomes a large amount of friction. This, of course, is correct, but does not give a full solution; for it may also be asked, why a mere wheel being round, produces this economy; the more philosophical answer being because the vital principle of the wheel is a lever of the dynamic series. From this fact, one of two deductions only can be made; namely, that economy or saving of power *is* produced by use of a dynamical lever, or that the wheel is not a lever.

Again, take another variety of this kind of lever—a man's legs. Given, A and B, two men of exactly equal powers, let A use his own legs, and B have stilts added to his, enabling him at each stride to step three times the distance of A, and it must be conceded that if there is no gain or economy in the dynamic lever, that A will be able to walk as far in any given time as B. But we know that this is impossible, hence the manifest gain by use of the lever; and those who would deny the gain or saving produced by the lever, will be forced to deny the fact that legs are levers.

Furthermore, the closer the student of nature examines the wonderful structure of all living creatures, he finds that nothing is created by accident, everything that God has created being supplied with most perfect means for any desired end, and becomes more and more impressed with the wonders of the universe, and the goodness and absolute wisdom of its divine architect. Therefore, he who would still dispute the economy of the dynamic lever, must be prepared to deny the wisdom of the All Wise.

Were the practical effect of this fallacy limited to the mere expression of opinion, and did it not interpose a serious obstacle to the advancement of a very important branch of science, namely, that of propulsion and steam navigation, it would be an error of small importance.

The paddle-wheel, owing to its axis being the actual and true line of motion by which the speed of the boat may be measured, acts as a lever of the dynamic series, and much is to be gained in economy by the proper application of power; for from the application of power to the axle of the cart wheels, and to the axis of the levers we call legs, it is evident that the nearer the power is applied to the axis or line of motion, and the longer the lever used, the greater the economy. Therefore, it stands to reason, that the shorter the crank by which the axis is turned, the greater the economy—provided always, however, that this gain or saving shall not be lost or counterbalanced, owing to some radical defect in the present rotary system, as is actually the case.

Hence it is that well-informed engineers, and many scientific men, overlooking the fact of the difference in effects produced by statical and dynamical levers, and not realizing the fact that the paddle wheel acts as a dynamical lever, having its great economy overshadowed by the natural defects of the present rotary system of steam navigation, have *erroneously* decided that there is no economy or saving in the short crank. The writer has spent several years, and some thousands of dollars, in the practical study of propulsion, and has abundant evidence to show that, given the same boat, the same power, and the same paddle, if the crank be one half length of radius of paddle, the "slip" will be much greater than if some power is applied to a crank of one eighth or one tenth.

Now, as it can be proved that propulsion is simply a question of power and comparative resistance, and that the "slip" is diminished by shortening the crank, it follows, that if some other system, not rotary, could be adopted, that the application of the power as near the axis as possible, and as far away from the fulcrum (which in propulsion is the water at the propellers) that the limits of increased economy can only be estimated by mechanical possibilities.

The writer has invented such a system, possessing not only the advantages of great economy in fuel and machinery, but also many important mechanical advantages over either screw or paddle wheels, which will form the subject of another paper.

I hope these remarks will clearly show that there are two classes of levers; namely, the statical and dynamical, and that while nothing can be gained or saved by use of the former, that the economy produced by the latter is almost limitless; and that by so doing, one of the errors that obstruct the path of the world's progress may be removed.

New York city. F. R. P.

Poisonous Drugs and Cosmetics.

MESSRS EDITORS:—In your issue of November 25, I notice an article headed "Poisonous Drugs and Cosmetics." Now while the writer fully agrees with you that the evils to which attention is called are very great, he begs leave to differ as to the best curative measures, and he also thinks that the statement, "we believe there is no department of trade in which, as a rule, retailers know so little that is requisite to the proper conduct of their business as in the drug trade," was made without due consideration, and that it is altogether too sweeping a condemnation of the class.

The head of the largest drug house in New York remarked, after twenty-five years of daily dealings with retailers in every State in the Union, that, "outside of the learned professions, no class of men possessed so much intelligence." You fortify your statement by the fact that "a druggist doing a large prescription business did not know that vinegar contained acetic acid." Now, unfortunately for the public, they are very apt to give their patronage to the man who will sell the cheapest, in this trade as in others, forgetting that they cannot judge of the purity of drugs, or the ability of the dispenser, with the same accuracy as they can the quality of cloth, or the taste of the draper. Thus many a man builds up a large business who, judged by the standard of an experienced pharmacist would not be thought fit for a third assistant in a first-class store. If mistakes occur, and ignorance is shown, in such cases, who should bear the blame,—the class of intelligent apothecaries, or an unwise public? We answer, so long as the public will employ physicians or apothecaries who are not regularly educated they must take the consequences if mistakes occur. We advocate the most thorough education on the part of the apothecary, but we think that the public are bound on their part to liberally support such men.

That "nothing should be done blindly" is impressed upon the mind of the youngest boy in the trade, as one of his earliest lessons, in all well-regulated stores. No rule is more thoroughly established and constantly acted upon than this. If an overdose of a powerful medicine is ordered, the prescription is re-submitted to the prescriber; thus many times when physicians wish to order large doses of powerful medicines they find it difficult to get the prescription put up by the careful apothecary.

"Finally, prescriptions should be written plainly in plain English." One would suppose, to hear what is said, and to read what is written on this subject, that physicians adhered to obsolete and inconvenient Latin names for drugs, for the sole purpose of mystifying their patients. Let us examine this matter. That certain exact and invariable names, understood alike by the physician and the apothecary, must be used, is evident. The botanical names of plants, and the chemical name of chemicals, form the basis of the nomenclature of the United States Pharmacopœia. Should we gain anything by a resort to English names? Let us see. What, for instance, is the English name of the plant known in the Pharmacopœia as *Cypripedium pubescens?* It is called in various localities, nerve-root, nervine, moccasin plant, and ladies' slipper. What is the English for the *Gaultheria procumbens?* It is known as wintergreen, partridge berry, deer berry, tea berry, mountain tea, and checkerberry; and no two old ladies well versed in herbs will be found, who can agree that these names all refer to the same plant. "Wintergreen, indeed!—why that's another thing altogether," one says. To be sure, the common princess pine is also known as wintergreen. Indian hemp may mean the *Cannabis Indica*, or it may mean the *Apocynum Cannabinum*—two articles widely different both in nature and use.

Among chemicals, the synonyms are not so many, yet who would choose to give up the simple, exact, and descriptive chemical names for the inaccurate, and in many cases foolish common ones? If common names are not adopted, how are the mass of mankind to know what they are taking; for how many people in the hundred know even that Epsom salt is sulphate of magnesia? If people have studied medicine sufficiently to be able to judge "whether the dose presented to their lips is calculated to heal their infirmities or send them to eternity by the run," they ought at least to know the scientific names of medicines. The fact that these names are used is, too, something of a safeguard to the public, as it obliges the apothecary to know at least this much, although it is a very small part of the knowledge of the intelligent man, who will know thoroughly the thing itself, not barely its name.

The nomenclature of our Pharmacopœia, as well as the body of the work is revised once in ten years by a committee of able and scientific men, of whom Dr. Squibb has done, perhaps, more than any other man to perfect it.

The subject of abbreviations has been often and well discussed, and those sanctioned by use are such as cannot without gross carelessness be mistaken, if plainly written. We deny that the profession is behind any other in intelligence, or in a desire for advancement, and would ask all skeptics to read the *Journal of Pharmacy* and the proceedings of the American Pharmaceutical Association, at its annual meetings. Five colleges of pharmacy are already in existence, where lectures on botany, chemistry, materia medica, and the art of pharmacy are delivered by able professors. Young men are encouraged by their employers to attend these lectures, and to gain the diploma of these institutions. But something more is needed—it is this: a wise legislation which shall provide in every State a board of examiners whose duty shall be to test the qualifications of all who desire to practise the art, and whose certificate of ability shall be necessary before they are allowed to do so. Then, the public will have some protection, and not till then.

The public, also, must be educated to look upon the business in its true light, and it must be as willing to pay the educated pharmacist for faithfully compounding a prescription, as it is now to pay the physician who prescribes it. Then, perhaps, the assistant who works now, for fourteen hours a day, for from $12 to $18 a week, may earn as much as a mechanic.

All "cosmetics" and secret preparations should be obliged to pass examination before a Government assayer before they are allowed to be vended to a credulous and ignorant public; then perhaps we shall hear of fewer cases of poisoning from this source. I beg leave respectfully to commend these suggestions to our legislators as the view of

A PHARMACIST.

[We cordially give place to the above excellent communication, and add that the suggestion that all ready-made preparations kept for sale by druggists should be submitted to examination by an official appointed for that purpose meets with our entire approval.

In the matter of prescriptions, we do not object to the use of Latin names when there is any ambiguity involved in the use of an English one; but the names of drugs are not all that is contained in a prescription—there are also quantities and directions for use. We yet fail to see why "every other hour" should be written in Latin: "*alterna quaque hora*," and abbreviated at that into "*alt. q. h.*," or why "*cochl. amp.*" is better than "a tablespoonful;" "*bis indies*," abbreviated into "*bis ind.*," better than "twice a day," and so on. When our correspondent shows why they are better we will unsay what we have said on the subject of prescriptions.

If the suggestions we made in the article referred to by our correspondent were carried out, there would be no danger that the public would patronize incompetent druggists on account of cheapness; there would be none of that character to patronize.

We admit that all people are not competent to judge whether drugs prescribed are beneficial or hurtful; but when, as in the instance we alluded to in the article questioned by our correspondent, a mistake is made in so powerful a drug as opium, and one patient is able to detect that the dose is too large when the prescription reads "*Tinc. Opii*," more could be found who could detect the same error, the drug being called simply "laudanum."

Practical Tanning.

MESSRS. EDITORS.—The article on tanning, in No. 18, current volume, is more theoretical than practical in its details. As a practical tanner in the good old way I should like to make some remarks showing the inconsistency of the correspondent in regard to tanning. The making of leather is a chemical process and therefore rests upon a principle that knows no change either in France or America. The first thing done, is (so the article reads) to throw the hides in the lime to loosen the hair. Now a good tanner would laugh in his sleeve at the simplicity of the idea, for, if that was all, then we could easily dispense with the liming process, as we do in making "sole" in our large tanneries. I was taught that it was for the purpose of softening the gelatine, a constituent of the skin, and leaving nothing but the cuticle or true skin to work upon. Lime having the solvent quality, performs its office in a perfect manner, at the same time loosening the hair so that it can be easily removed. The next step in practical tanning is of the utmost importance, and one which the article referred to completely ignores. My opinion is, that the tanners at Pont Audemer threw dust in the eyes of the correspondent, so that he was left in the dark as to their method of preparing the skins for the ooze. In liming we have softened the tissue and the next step is to remove the gelatine or gluey substance so that we can have a soft pliable skin to work upon. This is done by what dyers call a mordant.

Now I doubt very much if the waters that run through Pont Audemer possess the power, although the correspondent says they threw the skins in the river to remove the lime, and thence to the vats and cover them with "juice of tar" which is a ridiculous blunder on his part. The mordant used in this country and England is the droppings of the hen or pigeon house; others are used, but these are the principal ones employed in all sections for upper and calf. We, practical tanners, call this process "bating," that is, we mix a certain amount of this manure with water, and throw our hides or skins into it. Once or twice a day they are raised, and as soon as they begin to soften, work them over on the beam; this is done until they are cleansed from lime and glue and present a soft pliable appearance when they are ready for the tan, but not the "tar."

The idea of putting skins from the "bate" into strong ooze is simply absurd, as it would be to eat alum or a green persimmon before taking a piece of pie or sweet cake. French calf is remarkable for its fine grain and soft velvet appearance which can only be secured by careful handling in a weak solution of tan. To put green skins in strong tan would draw the grain hard and coarse, it being an astringent in its nature; and hence the philosophy of handling in weak ooze and gradually raising the strength until a good color and grain are secured when you can bring on the "tan." The idea of laying away in dust may do, yet there is nothing gained by the operation, as the leather cannot absorb the tan without moisture, hence you only loose time. You want sufficient to cover the mass and let it lay three to four months; then change and make a degree stronger, until your leather is completely tanned, even if it takes a year or two, the longer the better. I wish some of your scientific readers would give the reason why the tanning principle in bark grows weaker as you go West. I have conversed with tanners in various western States who have emigrated West and they all agree upon this, that it takes more bark than it did East to tan a given number of hides.

S. P. W.

Mechanicsburg, Ill.

[We are always happy to receive letters from practical men—and hope our correspondent will follow up the subject by sending us other articles. "Juice of tar," in the original article may have been a typographical error.—EDS.

A Central Invention Bureau.

MESSRS. EDITOR:—I am much pleased to see you advocating the necessity of a "National Invention Bureau." I have thought a great deal in regard to such a thing, and have decided that the country calls for it. About eighteen months ago I sent a letter, containing hints of the necessity of an association of the kind, to the Farmers' Institute Club, in New York; it was published in the New York *Tribune*, but that seemed to be the end of it. Probably its source was too obscure to demand attention. If Henry Ward Beecher, Horace Greeley, or some other shining light had made the suggestion, doubtless it would have been heeded. An association, or stock company, organized for the purposes as mentioned by you in the SCIENTIFIC AMERICAN, would, beyond doubt, be a source of much profit to the association, a good thing for the inventor, and a still greater benefit to the country at large. As soon as it would be known by inventors that they could have their machinery advertised and exhibited by competent mechanics, at the commercial metropolis of the United States, they would make application, and either pay a sum for exhibition, or have their rights for sale on commission, at a place where the people generally could see them. No better advertisement could possibly be obtained. It would be an inducement to inventors to construct their models in a workman-like manner, and put them in good running trim. All the inventors in the country would visit a place like that; all noted patent right dealers would go there for information. It would save the country from being imposed upon by bogus patents; it would save a vast deal of false circular printing; it would throw on the market, at once, any invention which might be useful to the farmer or the mechanic; it would save thousands of dollars to individuals, spent now "lawing" each other over some infringement in bogus sale. In fact, the present system looks very much like a headless man walking about over the country—making numerous mis-steps, for want of brains and eyes. In truth, we want a head and shoulders, as a grand center directory for the exhibition and sale of the new productions of the country.

Please stir the subject till the right men take hold of the matter. As for myself, I have three or four patents, and probably may have more in a short time, and I feel personally anxious about the matter.

JAMES H. REYNERSON.

Clayton, Indiana.

Preservation of Wood from Decay.

MESSRS. EDITORS:—For the past thirty-six years my attention has been directed to the subject of defending every species of wood from decay, and also to make it incombustible or fire proof. Beside making thousands of experiments, I have assisted others to institute them, and have watched the progress which has been made by the various patents issued for this purpose, such as kyanizing by the use of bichloride of mercury; the Burnett process, (chloride of zinc); the Earl process, (protosulphate of iron); Behr's plan, (solution of borax); Heinemann's patent, by the use of resin; the carbolizing method, the subject of two patents, one for cold carbolic acid, and one for hot acid; the tar and petroleum method as used in the Nicolson pavement, and many others, which have been brought out from time to time, but without having achieved permanent success.

I claim the first application of silicates in their various forms to all organic substances, such as woody fiber, paper, pasteboard, etc., for preventing the attack of the *teredo navalis*, fire, and water. I have frequently shown that by applying, by double chemical affinity, the silicate of soda and lime water, as I will presently describe, I convert the woody fiber into a mineral substance. This process is the most reliable and economical of any I have seen.

Railroad sleepers have to be replaced, under the circumstances most favorable to their durability, every five years, never remaining sound over seven years, and generally lasting only three years. I saw in California, in the gold diggings, timber that had rotted in two years, and was informed that cross ties seldom lasted longer than that period. If we calculate the number of railroad sleepers to the mile, which is 2,112, and their cost at 50 cents each, keeping in mind the fact that we have 40,000 miles of railroads in the United States, the annual cost per mile of replacing sleepers appears to be about $150, even if they lasted an average of seven years. Statistics show that farm houses of wood, wooden bridges, etc., last on an average about 30 years, and demand no less than $100,000,000 annually for repairs. A large proportion, if not the most of this immense sum, could be saved by the use of soluble glass.

My method, described years ago, is simply to steam the timber, then inject a solution of silicate of soda for eight hours, and then soak the wood the same period in lime water.

DR. L. FEUCHTWANGER.

What Farmers Want.---Inventors take Notice.

MESSRS. EDITORS:—While machinery has done very much for the farm, there are yet some unsupplied gaps to be filled to make the mechanical aid complete. One in the hay-making process. We have excellent mowing machines, and horse tedders, and horse rakes, and good horse forks for unloading hay in the barn, where there are no cross beams in front of the mow, but it costs as much as it ever did to get the hay from the field to the barn. We want a machine—a kind of rake—on wheels, eight or ten feet apart, drawn by a single horse, that will go into the spread hay, rake up and load upon itself eight or ten hundred pounds of hay, and bring it to the barn without further aid than the boy that drives it can render.

Most farmers have two horses, and most meadows are not one quarter of a mile from the barn; and with two such machines, ten times the amount of hay usually gathered by the two-horse hay wagon, and the pitcher, and loader, and raker after, could be stored in the same time and with much less labor. The farm pays heavily for the machinery it wants, and for some that it does not want. And the inventor who can make a simple machine for the purpose named (first reading editorial article in SCIENTIFIC AMERICAN, entitled, "Poor Mechanical Work on Agricultural Machinery," December 16, p. 93) need have no apprehension about its not paying. Give over velocipedes and rat traps, and give the old "Mother of Arts" a hoist.

A. N. C.

Sheffield, Mass.

What a Mechanic Thinks.

MESSRS. EDITORS:—It gives me the greatest pleasure to send in this $3 for the SCIENTIFIC AMERICAN another year. I cannot help giving vent to my feelings by saying a word in praise of the SCIENTIFIC AMERICAN. It meets from me a hearty welcome every week. I often wonder how such a paper can be got up for $3 a year, when we have to pay that amount for common papers, printed on poor paper, poor type, done up badly, and sent any how; and a person is none the wiser who reads them.

I have worked in a machine shop, and run steam engines for more than twelve years, and the SCIENTIFIC AMERICAN just hits my case; I have learned more from it than any one thing I ever read. People often say that the SCIENTIFIC AMERICAN is just the paper for me, because it is a mechanical paper. Now I contend it is just the paper for them also. I value my SCIENTIFIC AMERICAN papers very highly—so much so that I have them nicely bound—and I should not take for them what they cost me. They make a book to be proud of. I was the means of your having a few subscribers for the SCIENTIFIC AMERICAN last year. In fact, I often advise my shopmates to take it. I often wonder how some mechanics slide along, year after year, and only learn what is pounded into them.

One more important thing and I close. I often read of boiler explosions, and I wonder why they are not more frequent. I think if those using steam power should furnish their engineer with a copy of your paper, they would be the gainers by it.

EDWIN FLINT.

East Canaan, N. H.

Dangerous Hair Washes.

MESSRS. EDITORS:—The article in your paper of 9th inst., on "Hair Washes," should receive the widest publication, as a warning against their use. Nearly all of the boasted "Vegetable (?) Hair Restorers," which are so extensively advertized, and correspondingly extensively used by the innocent public, contain lead in one or more chemical forms—mostly sugar of lead—the poisonous qualities of which ingredient can be attested by any one acquainted with medicine or chemistry, and by those who have been using any of these restorers. If the country is to be flooded with articles for the purpose of satisfying the vanity of those who have lost their beauty, by the blanching of their former raven locks, the makers of these compounds should know the peril to which they subject all who use them.

It would also be proper, if "hair restorers," or "hair color restorers," are to be used, to invite the attention of inventors or chemists to the propriety of the production of such articles as will have the desired effect, without the danger which now threatens those who use them.

By devoting your columns to the ventilation of this subject you will be adding much to their usefulness, and be doing at the same time a favor for much suffering

Philadelphia, Pa.

HUMANITY.

Patent Wire Shears and Pliers Combined.

Artisans have long felt the need of such a tool as the annexed engraving represents. Its advantages over others for the same purpose are very great. The jaws of the pliers are constructed in the required form, without the knives at the sides to obstruct their free use, as in the old combined cutting pliers.

The shears are made in the joint, which is formed of two smoothly faced surfaces held firmly together, and moving on a common center in opposite directions, as the pliers are opened and closed.

These surfaces are, in fact, two circular plates of steel, which being angularly notched at the periphery in one or more places, form the most perfect wire cutters in use. They are arranged so as to operate to the best possible advantage, either for ease of cutting or durability. The superiority of the shear cut, together with the increased leverage, enable the operator to cut a wire by one hand with these shears that cannot be cut by both hands with the ordinary cutting pliers; and while the mere attempt in the latter case would be almost certain destruction to the tool, the shears will cut the wire without showing any evidence of having been used. The utility of these combined pliers is obvious. Beside being useful to all who work in wire, such as tinsmiths, machinists, telegraph builders, hoop-skirt manufacturers, etc., every farmer and every housekeeper will find them quite as useful as a hammer or saw. They are made from best cast-steel, and are said to be equal in quality to the best Stubbs goods. The manufacturer has so much confidence in the success of these pliers that he will supply responsible parties in the trade with them, to be returned at his expense if found unsalable.

All orders or letters of inquiry addressed to L. Button, manufacturer of steam and hand fire engines, steam pumps, etc., Waterford, N. Y., will receive prompt attention.

WIRE SHEARS AND COMBINED PLIERS.

Inter-Communication---The Pacific Railroad and the Proposed Darien Ship Canal.

The New York *Shipping and Commercial List*, in favorably quoting our brief article on page 345, last volume, on the facilities for international communication, very truthfully says:

Our cotemporary's views, with regard to the relative cost of water and land transportation, are substantially correct. Still, a good many light costly goods, from Japan and China, such as silks, opium, etc., must inevitably come by the Pacific Railroad. But the transportation of tea, in any considerable quantities, over this route, may reasonably be doubted, as, in the opinion of the trade, the length of the carriage by rail would result in so pulverizing the article, as to detract materially from its value. There cannot be the slightest doubt, however, that the traffic between the Eastern and Western portions of the Continent, together with the business which a short route to China is certain to bring, will afford the Pacific Railroad all the business which it can accommodate, to say nothing of an important intermediate commerce, which it must build up. Nothing is more certain than that this great highway will, within a brief period, be instrumental in thickly populating a vast extent of country, stretching away from the Missouri River to the Rocky Mountains, thus rendering necessary a network of railroads similar to that in the Middle and Northern States. East of the Mississippi and Missouri Rivers there was, in 1860, a population of twenty-seven millions: westward there was less than one thirtieth the population, though double the area. And yet this great area is full of mineral and agricultural wealth; so full, that thirty-five millions of dollars of gold and silver are drawn from it every year, and the rich valleys of the pregnant rivers yield a maximum of agricultural products in return for a minimum of toil. The greatness of the traffic which will come to the great national highway between the Atlantic and Pacific, all contributing to its success and profit, can hardly be over estimated. That it will be so vast, a few years hence, as to necessitate one or more through roads may, we think, be taken for granted. But, for our countrymen to control the rich trade of China, India, and Japan, a cheaper and shorter water route is absolutely essential. This want will be supplied, as soon as science shall assure us the projected Darien Canal; the Isthmus being unquestionably the key to commerce between the Atlantic and Pacific Oceans. Since Cortez first viewed the two oceans from an elevation on the Isthmus, this magnificent project has been the dream of philanthropy and of liberal enterprise. The Spaniards, the French, and the English have repeatedly, during the last three centuries, sent expeditions to solve the problem. No less than nineteen canal routes, and seven railroad and common road lines, have been contemplated, only one of which—the Panama Railroad, an American enterprise—has been accomplished. This avenue, in connection with the steamship lines, has been a potent element in the development of commerce; but what it has accomplished, cannot be regarded as an accurate index of the success that would be likely to attend the canal. We are pleased to know that this grand project is assuming a shape that will, sooner or later, insure its consummation. The leading merchants and capitalists of the United States have taken it in hand, and with them "there is no such word as fail."

"The Wheel, the Axle, and the Rail."

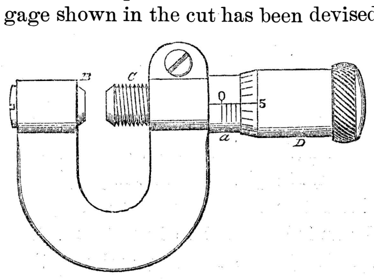
This is the title of a circular containing valuable tables and other information for railroad men, compiled for the Ramapo (N. Y.) Wheel and Foundery Co., by W. G. Hamilton, engineer. We extract from it the following statistical information about car wheels:

There are in daily use on the 37,000 miles of railway in the United States, not less than 1,250,000 truck and car wheels, under 8,500 locomotives, 5,500 passenger cars, 2,700 baggage and express cars, and 160,000 freight cars.

The available statistics show that passenger cars make an annual mileage of 28,400 miles, or 88 75-100 miles per day of 320 days per annum; the average load borne on each car wheel to be 3 1-3 tuns. With this load the average life of a wheel is 45,000 miles or 1 58-100 years. On trains running at express speeds, the average life does not exceed 10 months' service, while wheels under tender trucks have a life of 18 months. Under freight service in the State of New York, with an annual train mileage of 11,483,123 miles, transporting 75·5 tuns of freight per train, the annual mileage per car was 14,649 miles, each wheel bearing an average load of 1·47 tuns, which gives 3·08 years as the life of a freight wheel, corresponding with the experience of one of the principal roads in the State. But assuming that the average life of car wheels, under all kinds of service, as being five years, the total number of wheels worn out annually in the United States will not be less than 250,000. At an average cost of eighteen dollars per wheel, allowing one-half for their value for the old wheel, the annual loss may be stated at two and a quarter millions of dollars.

POCKET SHEET METAL GAGE.

The difficulty of accurately measuring the thickness of sheet metals is well known to all persons who have occasion to use or deal in them. The edges of metal being often imperfect, ordinary gages are prevented from going on readily. It also usually happens that the extreme edges are thinner than the rest of the sheet and cannot therefore be relied upon to give the thickness correctly. In selecting sheets for many purposes, it is desirable to have a gage to indicate the exact thickness in parts of an inch, and to accomplish this result the gage shown in the cut has been devised, which will show the thickness of a piece of metal up to three tenths of an inch in thousandths of an inch, and at some distance from the edge of the sheet. The piece in form of the letter U has a projecting hub, *a*, on one end.



Through the two ends are tapped holes in one of which is the adjusting screw, B, and in the other the gage screw, C. Attached to the screw, C, is a thimble, D, which fits over the exterior of the hub, *a*. The end of this thimble is beveled, and the beveled edge graduated into twenty-five parts and figured, 0, 5, 10, 15, 20. A line of graduations 40 to the inch is also made upon the outside of the hub, *a*, the line of these divisions running parallel with the center of the screw, C, while the graduations on the thimble are circular. The pitch of the screw, C, being 40 to the inch, one revolution of the thimble opens the gage $\frac{1}{40}$ or $\frac{25}{1000}$ of an inch. The divisions on the thimble are then read off for any additional part of a revolution of the thimble and the number of such divisions are added to the turn or turns already made by the thimble allowing $\frac{25}{1000}$ for each graduation on the hub, *a*. For example, suppose the thimble to have made four revolutions and one fifth. It will then be noticed that the beveled edge has passed four of the graduations on the hub, *a*, and opposite the line of graduation will be found on the thimble the line marked 5. Add this number to the amount of the four graduations, which is $\frac{100}{1000}$, and it equals $\frac{105}{1000}$, which is the measurement shown by the gage.

The gage illustrated above, which is full size of implement, will measure the thickness of sheet metal or other material, by thousandths of an inch up to three tenths of an inch at any point within half an inch from the edge and will also answer to measure the diameter of wire. Means of adjustment are provided in case of wear by continued use.

The attention of machinists is called to the usefulness of this gage for convenient and accurate measurement. It is light, small, and suitable to carry in the pocket. Address for further particulars, Brown & Sharpe Manufacturing Company, Providence, R. I.

A CITIZEN of Mechanics Falls, Maine, has a very old coin, a Spanish silver dollar, bearing the date 1179. The figures and lettering are very perfect. On both sides there are several Chinese letters or characters, about twenty-three in number.

The Origin of Porcelain.

An apothecary's assistant at Berlin, John Frederick Bottcher by name, being suspected of alchemy, fled thence to Dresden, where the Elector, believing him possessed of the secrets of the transmutation of base metals, and their conversion into gold, placed him in the laboratory, and under the close surveillance of Tschirnhaus, who was seeking for the Universal Medicine. It was here that the contents of some crucibles, prepared for alchemical purposes, unexpectedly assumed the appearance of Oriental porcelain, which had been introduced into Europe from China, after the voyage of the Portuguese navigators around the Cape of Good Hope, and which was even then much prized by and only in possession of the wealthy. Augustus II. appreciated the importance of the discovery of Bottcher, and removed him to the Castle Albrechtsburg, at Meissen, where, with an officer as a constant attendant, he was provided with every comfort and luxury, and with every facility for his research, till, in 1709, the true white porcelain was produced; and, in the succeeding year, the great manufactory at Meissen was established, with Bottcher as director.

The secret thus discovered was carefully and jealously guarded; strict injunctions, with respect to secrecy, were enjoined upon the workmen. The establishment in the castle was a complete fortress; the portcullis raised neither day nor night, and no stranger allowed to enter, whatever the pretence. The chief inspector and all under him, were sworn to the closest silence, with the punishment of imprisonment for life attached, for divulging aught connected with the manufacture. Every where around the establishment was the warning motto: "*Be Silent unto Death.*"

Despite these injunctions and precautions, and even before Bottcher's death, which occurred in 1719, one of the foremen escaped from the manufactory; and, going to Vienna, was cordially received by Charles VI., and granted the exclusive manufacture for twenty-five years. Thence the process, no longer a secret one, spread over Europe, and the art, relieved from its cramping restrictions—and with the incentive of rivalry among various manufacturers—assumed its proper importance, and made its products available to all classes.

What it Costs to Go Around the World.

Putnam's Monthly for January says the circumnavigation of the earth has become an easy and not a very expensive undertaking. A European journal gives the following estimate, taking Paris as the starting point; we translate the sums into greenbacks:

From	to	First class fare
Paris	Marseilles,	$25⅔
Marseilles	Alexandria,	137⅛
Alexandria	Suez,	20⅛
Suez	Aden,	266⅔
Aden	Point de Galle, Ceylon,	200
From Paris to Ceylon,		$650

From Point de Galle the circumnavigator has choice of two routes. The first and most direct is *via* Japan, as follows:

From	to	First class fare.
Point de Galle	Hong Kong	$200
Hong Kong	San Francisco,	420
San Francisco, *via* Panama and St. Nazaire, to Paris,		517
Ceylon to Paris,		$1137

The other, *via* Australia:

From	to	First-class fare
Point de Galle	Sydney,	$333⅓
Sydney	Panama,	420
Panama	Paris,	342⅔
Ceylon to Paris,		$1096

The time occupied by the two routes is thus given:

From	to	Days.	From	to	Days.
Paris	Ceylon,	25	Paris	Ceylon,	25
Ceylon	Sydney,	24	Ceylon	Hong Kong,	15
Sydney	Paris,	55	Hong Kong	Paris,	64
Total,		104	Total,		104

It is estimated, however, that when the Pacific railroad is completed, the journey around the earth will be reduced to eighty days, traveling time. Not only the intercourse between China and Japan and Europe, but between Australia and Europe, will then find its speediest route across the American continent.

A Better Umbrella Wanted.

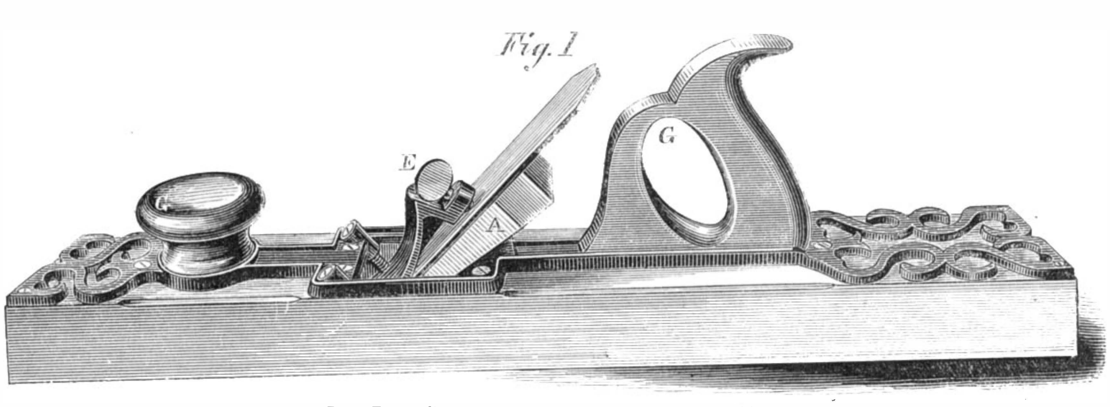
A correspondent in one of our exchanges asks the question:

Will no inventive genius improve upon the construction of the umbrella? As at present formed this indispensable article is shockingly ill adapted to its purposes. The best part of it, where one would put his head, is occupied by the stick and wires, so that only half the sheltering cover is available. Then the roof is so contrived as to cast the rain that falls upon it either on to the shoulder or into the coat pockets, or down over one's knees and feet. To remedy these evils the stick should be placed out of the center, and a turned-up rim should be made to constitute a gutter, with one shoot or spout only, which can be turned into such a position as to throw the water always to leeward of the pedestrian. If I were an umbrella maker I would endeavor to work out these improvements; as it is I can only enforce them upon the attention of those whom they may concern.

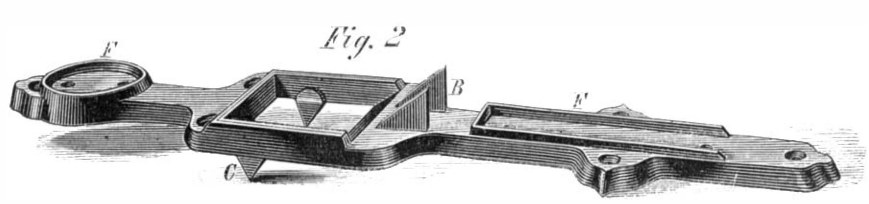
A CONVENTION of white lead manufacturers was held in St. Louis on November 11. The object was to effect a concert of action on matters relating to the trade, and the further object of promoting the interests of Western white lead manufacturers exclusively, reducing the price of white lead, and ridding the markets of adulterated material.

Improvement in Plane Stocks and Irons.

Even when constructed of the best seasoned wood and of such necessary dimensions as to make it heavy and unwieldy, the ordinary plane stock occasionally warps and has to be redressed on the face. The common method, also, of adjusting the bits or irons tends to spring the plane and to destroy the wooden key or wedge. Both these difficulties are intended to be obviated by the improvements shown in the accompanying engravings.



SMITH & CARPENTER'S PATENT PLANE.



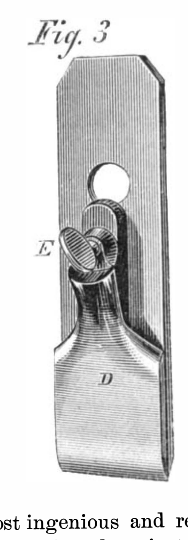


Fig. 1 shows an improved plane, the stock lighter than usual, and stiffened, strengthened, and adjusted, as to weight, by an ornamental malleable iron or brass casting extending its whole length. Fig. 2 is an iron cap similar to that in Fig.1 but specially adapted to planes as ordinarily used, these being susceptible of receiving this improvement without costly alteration. Fig. 3 is a common plane iron, or bit, with a metallic wedge instead of the wooden wedge, and double or stiffening iron, both of which it supersedes.

The plane—Fig. 1—has a fixed incline, A, secured in the throat of the plane by a common wood screw passing through a slot in the incline so that it may be adjusted as necessary. This has a bearing on the inclined supports of the metallic top, seen plainly at B, Fig. 2. The pointed, downward projections, C, same figure, engage with the upper surface of the wedge, D, Fig. 3, and the thumb screw, E, by turning one way, brings the wedge firmly against the bit near its edge, and by turning in the other direction, after being seated in the plane, presses the wedge, D, against the projections, C, holding both bit and wedge firmly. The recesses, F, Fig. 2, are for the reception of the handle and guide, G, Fig. 1. In the ordinary slotted plane iron the screw, E, turns in one end of a strap that slides in the slot of the bit, the other end being held to the bit by the ordinary flat headed screw.

In the plane represented in Fig. 1 the screw, E, sets against the plane iron or bit, which has no slot in it. In this figure two adjustable screws passing through the metallic capping serve the same purpose as the projections, C, in Fig. 2, acting as fulcrums against the wedge. By this improvement the width of the mouth may be instantly adjusted to suit the different kinds of wood worked or the different demands of the work. The metallic covering of the stock may be removed from a worn out stock and adjusted readily to another block. Practical workmen will readily discover the advantages of this improvement.

Patented through the Scientific American Patent Agency August 25, 1868, by Smith & Carpenter. Other features are covered by a caveat subsequently filed. For further information address F. Smith, 11½ West King street, Lancaster, Pa.

THE BAROMETER.---ABSTRACT OF A LECTURE BY PROF. GUYOT.

Reported for the Scientific American.

The third lecture of the scientific course before the American Institute, was delivered by the veteran physical geographer, Prof. Guyot, whose labors in this field were eloquently alluded to by Judge Daly, in introducing the lecturer to the large and appreciative audience present on the occasion.

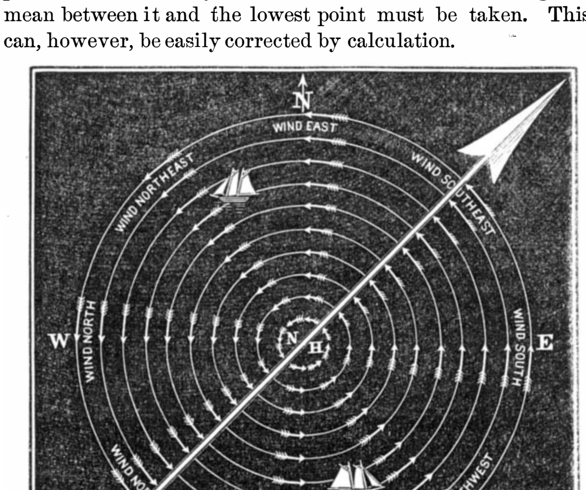
The lecturer introduced his subject by an allusion to the three forms of matter of which the earth is composed, viz., solid, fluid, and gaseous. The aqueous portions of the globe contain all, or nearly all, the lowest types of animal life, the solid land being the home of the higher types, including man, the crowning work of creative power. The gaseous portion of the globe —the atmosphere—is composed chiefly of oxygen and nitrogen; one volume of the former to four of the latter, or 23·82 parts by weight of oxygen to 75·55 parts of nitrogen.

The motive power of animals, as well as much of that used in engines for the propulsion of machinery, is derived from the union of the oxygen contained in the air with other substances. Most of the influences which affect the life and growth of the higher orders of animals and plants, and to which the general name of "climate" has been applied, originate in the atmosphere and depend upon changes in its heat, moisture, and weight. Although the subject of the present discourse pertained strictly to the weight of the atmosphere, it could not be considered independently of some of the phenomena of heat and moisture.

Prof. Guyot next discussed the depth of the atmosphere, and its variations of density for different altitudes. The depth of the atmosphere is estimated at forty-five miles, but the lower four miles of this depth contain more than one-half its entire weight. This point was illustrated by a large and beautiful colored diagram, in which the blue color of the atmosphere was shown gradually shaded out toward its upper limit, and the hights of the loftiest peaks of the Alps, Andes, and Himalayas, contrasted with the entire depth of the ærial ocean. It must not be supposed that a definite upper limit to the atmosphere can be fixed although it can be approximated. A very thin pellicle of air surrounding the globe contains nearly all the organic life upon it. If a globe fifteen feet in diameter should be taken as a representative of the earth, a stratum of any substance taken to represent the layer of air in which organic life exists would be only a small fraction of an inch in thickness.

The lecturer next proceeded to define the word barometer—a measurer of weight. Until the 17th century the air was generally believed to have no weight. Aristotle tried to demonstrate the weight of the atmosphere but failed to do so. Galileo determined it first. He showed that water would only rise in a tube when the pressure of the air was removed from its upper extremity beyond a definite hight. His pupil, Torricelli, following in the footsteps of his illustrious master, conceived the idea of substituting mercury on account of its greater weight for the water column. He filled a tube, closed at one end, with mercury, and, inverting it in a cup containing the same substance, found that the mercury settled to a given point, above and below which it fluctuated as the outside pressure varied.

Prof. Guyot here reproduced the Torricellian vacuum, with a glass tube and a tumbler, and stated that that apparatus was the best barometer that had yet been invented, although some improvements for convenience of transportation, but not affecting the essential principle, had been added to better adapt the instrument for scientific investigation. Scales of different kinds have been devised, but they all have for their object the measurement of the distance between the level of the mercury in the cup and the top of the column in the tube. This being the case, it is always important that the mercury in the cup should be adjusted to a fixed level, the zero of the scale, or that the error arising from its variation from that point, should be allowed for in reducing the observation. Other sources of error arising from differences in temperature, etc., were pointed out. The Torricellian vacuum could not be relied upon as being sufficiently perfect, unless all air had been removed from the mercury by boiling it in the tube before inverting it. The surface of the upper end of the column is convex, owing to the mutual repulsion of the glass and the mercury. The highest point of the convexity, is therefore, not the true reading. A mean between it and the lowest point must be taken. This can, however, be easily corrected by calculation.



The speaker next proceeded to describe various other barometers. The aneroid barometer was described as being an air-tight box with elastic walls, which are compressed when the weight of the atmosphere increases, and expand when the external pressure diminishes. The motion caused by the compression and expansion is multiplied by an ingenious mechanism and marked upon a dial by a hand. Although the instrument is sufficiently accurate for many purposes of observation, it can not be recommended for scientific investigation. The circumstances which render elasticity constant are subject to frequent disturbance; and a slight blow upon the exterior of an aneroid barometer is sufficient to change its zero, and give rise to grave errors. The instrument, although good for home use, is a bad traveler. Another instrument, invented by a French savant, consists of a hollow angular tube bent like a bow, which straightens or contracts with the varying external pressure, and which, by mechanism similar to the aneroid, marks the variations upon a dial. The same remarks were applicable to this instrument as were made of the aneroid barometer. The siphon barometer is the only one that approaches in reliability the original Torricellian barometer. This form of instrument, instead of having a tube of mercury inverted in a cup of mercury, has the lower end of the tube bent upward in the form of the letter *U*. The external pressure upon the open end of the upturned leg of the tube sustains the column in the leg of the tube, sealed at the upper end, so that the mercury in that branch receives no pressure from the external air. The addition of an ivory float upon the surface of the mercury in the open end of the tube having a thread attached to it, the thread passing over a small wheel attached to a hand upon a dial, and a counterpoise fixed to the end of the thread opposite the float, the whole being inclosed in a case, constitutes the common well-known wheel barometer. Another common form of the barometer is the tube and cup fitted into a wooden case with a vernier scale at the top. These different forms of the instrument were illustrated by diagrams. Two of the diagrams displayed upon the stage, one illustrating the self-registering and printing barometer invented by Prof. Hough of the Albany Observatory, and another the curve of hights from Oct. 5 to Nov. 3 1868, as delineated by that instrument, were not alluded to by the lecturer, probably for want of time. It is much to be regretted that an explanation of this beautiful and intricate device could not have been given. It depends upon the making and breaking of an electric circuit by the rising and falling of the mercury, for the communication of impulses to electro-magnets, which unlock a train of clockwork so devised as to not only to describe a constant curve upon a piece of paper, representing the hight of the column at any time of day and night for many days in succession, but also to print upon pages, which may be subsequently bound, the hights of the column as often as may be desired; thus, making a printed record with great accuracy, and with scarcely any attention being required other than to renew the battery and to substitute new slips of paper as often as they are filled with the record. The tube used is a siphon, and the means by which the above results are accomplished rank among the most ingenious and remarkable of modern inventions. The value of such an instrument to science can scarcely be overestimated. Neither was any mention made of the barometrograph, illustrated and described on page 149, of the current volume of the SCIENTIFIC AMERICAN, but it could scarcely be expected that more than a mere allusion to these ingenious devices should have been made in a single lecture. Such an allusion, however, was due to these instruments, as a tribute to their great scientific value and the genius displayed in their construction.

The speaker pointed out the fact that in the use of the ordinary wheel barometer errors were liable to occur, owing to the friction upon the float caused by the oxidation of the mercury and from other causes. These errors, and the fact that the public had in general been led to expect too much from them as weather indicators, had tended to make this form of the instrument unpopular. The value of a barometer as a weather indicator depends upon the correctness of the interpretations put upon its indications. It does all that it purports to do, that is, it indicates variations in the weight of the atmosphere. These variations are intimately connected with changes of weather, as they depend upon differences in heat, moisture, and direction of winds; but as the precise nature of the relations existing between these phenomena are in general very imperfectly understood, it follows that observers are by far more numerous than competent interpreters.

The form of instrument best adapted to scientific use is that adopted by the Smithsonian Institute, and hence known as the Smithsonian instrument. It is a mountain and observatory barometer, so called from its use in measuring hights in mountains and for observatory purposes. The lecturer himself had the honor of introducing these instruments into this country on behalf of the Smithsonian Institute. It can be divided into pieces of suitable lengths for easy transportation; has an adjustment for bringing the level of the mercury in the cistern to zero, a vernier scale for reading fractions of an inch, and adjustments which can be made to correct all the errors above enumerated, so that a simple reading can be made as exactly as can be done with the old form of the mountain barometer, without the necessity of subsequently reducing the results of the observations. This instrument is so perfect in its operations that a variation of $\frac{1}{2000}$ of an inch can be read. The lecturer has determined the hights of mountains with it within three feet of their actual hight as determined by angular measurement.

The lecturer next proceeded to show the causes for fluctuation of the mercurial column. These fluctuations may be divided into regular and irregular. The irregular fluctuations increase from the equator toward the poles. At the equator the fluctuations are mostly regular and uniform. The regular fluctuations are monthly, daily, and hourly. The monthly fluctuations are caused by the change in the relations of the position of the earth to the heavenly bodies. The daily fluctuations are caused by atmospheric tides, and the hourly to a variety of causes some of which are yet obscure. These variations are so uniform that Humboldt said of them that it was quite possible at the equator to determine the time of day by the barometer. The monthly variations are greatest in the tropics. The barometer stands lower generally in summer than in winter, the difference depending chiefly upon the greater amount of moisture contained in the air during the summer season, which renders the atmosphere lighter, the gas of water having only about six tenths the weight of air. The speaker dwelt at some length upon this point, but entirely omitted to mention the effect upon the atmosphere, of water existing as water in the air, as it occurs during the fall of rain or when it is suspended in the vesicular condition known as fog.

The irregular fluctuations are caused by changes in the temperature, hygrometric condition, and disturbances of the atmosphere by winds, which, as it were, roll a wave or swell of the ærial fluid before them. Such variations increase toward the poles, so that in our latitude the barometrical column is in a state of almost constant perturbation. These perturbations are so small, as in the ordinary mode of observation to be imperceptible, but they are none the less real.

The lecturer next introduced and explained diagrams illustrative of the variations in the barometrical column corresponding to the direction of winds, both in North America and Europe, and followed these with a diagram, which we reproduce herewith, illustrative of Redfield's theory of storms or cyclones, which he said was now fully established.

The large arrow in the diagram shows the general direction of a storm for the northern hemisphere, but while the storm, as a whole, proceeds from the southwest toward the northeast, it at the same time revolves around a center in the direction of the arrows, or in an opposite direction to the hands of a watch, the wind blowing in any part of the area covered by the storm as indicated by the direction of the arrows in that part of the diagram. As these storms approach, the barometer first rises abruptly then rapidly falls. As the first part of the storm that reaches us at any point to the right of the large arrow is the northeast part, the wind will consequently at first blow from the south east. As the storm advances the wind will blow successively from the south, southwest, west, and northwest, at which time the weather clears up and becomes settled. If at the approach of a storm to any point the wind blows from the northeast or east, that point lies to the left of the line of approach, as shown by the large arrow. The wind will then change, first to the north and from thence to the northwest which will end the storm.

Hundreds of millions of dollars might be saved if sea captains would understand and apply this theory. The position a vessel occupies in relation to the general line of progression, can be determined by the direction from which the wind blows at the point it occupies, and the vessel can then be headed so as to get out of the gale by the shortest route, as shown in the diagram, which explains itself.

Our limited space prevents us from doing full justice to this interesting and practical lecture, which was listened to throughout with profound attention, and frequently applauded, although more than usually protracted.

PHILOSOPHY OF THE TEA-KETTLE--A LECTURE BY PROFESSOR SILLIMAN.

[Reported for the New York Tribune.]

Professor Silliman delivered a lecture on the above subject before the American Institute, Dec. 16, 1868. After the usual introduction Professor Silliman commenced his lecture by narrating briefly the story of Watt's experiments with the tea-kettle in his youth, which first attracted his attention to the study of steam and its application to mechanical works. After some remarks upon the phenomena of heat, while the water in a vessel upon the stand was gradually rising in temperature, by the heat of a Bunsen burner, he said: This vessel which we are heating has now become filled with bubbles. Fishes breathe water because it contains atmospheric air, while it is richer in oxygen than common air. The first phynomenon therefore in seeing that kettle boil is the displacement of the air. Tasting water that has been boiled, after the air has been expelled, and before the air has time to return, it is flat and unpalatable. The tea-kettle is boiling under the pressure of the atmosphere. Every individual carries a tun weight in the pressure of the atmosphere upon his person. Ordinarily we do not feel it; but in walking on the surface of miry clay we feel it, because then the upward pressure on the soles of our feet is removed. The second condition we have to consider, then, in the boiling in the tea-kettle, is that we are boiling the water under the pressure of 15 pounds to the square inch. Boiling is not always necessarily connected with temperature. If the pressure of the atmosphere is taken off, in whole or in part, there may be ebullition without great heat. [Water at 120° was here boiled in the air pumps.] Boiling consists simply of little bubbles of vapor rising and escaping from the surface of the fluid. An egg might be boiled all day in water at 120° without being cooked, because it requires a greater heat to cook it. As these little bubbles rise in the tea-kettle, they strike a colder stratum of water and are condensed, the water failing to fill the vacuum, producing the sound we call the singing of the tea-kettle. The next stage of our process of boiling will be the process of distillation, which consists in the transfer of particles of water out of the liquid state into vapor, then its translation and final recondensation in another place.

The amount of heat passing into the water in the tea-kettle would be measured by the thermometer until it reached 212°. At that point the thermometer would cease to rise, although the heat was still passing as rapidly as before into the water; the surplus being employed in converting the water into steam, which escapes from the vessel. Having heated water in a glass vessel to the boiling point, we remove the fire and cork it up. It continues to boil; and upon pouring cold water upon the surface, it boils still more violently. Why? Because the condensation of the steam removes the pressure, and the water boils more readily, even at a lower temperature. He proceeded to try Count Rumford's experiment of building a hot fire, with a temperature of not less than 2,000° above a vessel of water. The surface of the water boiled, as shown by its condensation upon a cold glass plate laid above it; but the water in the vessel was not heated. It is necessary, therefore, to heat the tea-kettle at the bottom, and not at the top. If we desire to boil substances which will be injured by the temperature of 212°, we may readily boil them at any lower temperature above 100° by removing the pressure of the atmosphere. Taking equal quantities, by weight, of ice at 32°, and boiling water at 212°, the ice was melted by the water, and the temperature of the mixture was 52°. There had disappeared 140° of heat, and this was the latent heat, without which the water would remain ice. Everyone has noticed that the melting of ice in the spring causes a great chill in the atmosphere; for whenever and wherever ice is melted, it absorbs inevitably 140° of heat. On the other hand, the vaporization of water takes up a great deal of heat, which is rendered latent; for steam itself, at the pressure of the atmosphere, has only a temperature of 212°. If we measure the heat thus becoming latent, we shall find that it amounts to about 970°. By adding constantly a given quantity of heat, we shall find that it takes 5½ times as long to convert a given quantity of water into steam as to raise it from 320° to 212°. This latent heat would be enough to heat water, if a solid, red hot. If we add to the pressure of the atmosphere, we shall have a higher temperature of the steam; but the amount of latent heat in the steam will be less, the sum of the latent and the sensible heat being a constant quantity, equal to 1,180° Fahrenheit. The conversion of water into steam will expand it into 1,700 times its former bulk, and this exerts a prodigious amount of mechanical force which is utilized in the steam engine. Heat is nothing but a mode of motion; and the steam engine enables us to make that motion useful in the form of mechanical power. He illustrated the reconversion of motion into heat by rapidly turning a brass tube containing ether and corked up, and holding around it a wooden clamp until sufficient heat was generated to convert the ether into vapor and blow the cork from the tube. Count Rumford, in the latter part of the last century, tried a similar experiment upon a much larger scale. When in the employment of the Bohemian government at Munich, he made those remarkable experiments which have signalized his name in this department of knowledge; for he employed horse power in the boring of cannon held in a vessel of water at the ordinary temperature, noting the time occupied, and the amount of force supplied. In about two hours and twenty minutes he brought this large body of water into a state of ebullition, simply by the mechanical power applied in boring; and he determined by these experiments that in order to raise a pound of water through one degree of Fahrenheit, there must be a different power applied to raise one pound to the hight of 772 feet. This is what is called the mechanical equivalent of heat. Professor Silliman next treated heated water in a closed spherical vessel connected with a column of mercury and a thermometer. When the pressure of the steam had forced the mercury to the height of 33 inches, corresponding to a pressure a little more than that of the atmosphere, the thermometer had risen to 245°. He then opened a tube to allow the steam to escape into a vessel, at first producing a rattling sound in consequence of the condensation of the steam by the water and the falling of the water to fill the space thus left vacant; but very soon the water was raised to the boiling point, and the rattling ceased, and the steam passed noiselessly through the water, and escaped. It is easy to convey heat in the form of steam; and it is now common to convey it in pipes sometimes for long distances to wooden vessels, where it is desired to boil water. Steam is the most wonderful vehicle for transporting heat with which we are acquainted. This hall is heated by steam from a boiler in the celler, giving us 1,000 degrees of heat, the latent heat of the steam becoming sensible as it is condensed in the pipes, and with such astonishing rapidity that it sufficiently warms the atmosphere of the room, furnishing one of the most efficient means of heating which is known. Heating either by hot water or by steam, the relative merits of which I am not now discussing, is by far the most economical, the most efficient, and the most agreeable of all artificial means. Professor Silliman then exhibited a toy steam engine, rated at two-mouse power [laughter], and proceeded to give an explanation of the steam engine as invented by Watt. The first step of improvement was to close the cylinder at the upper end; hitherto it had been open. In the former steam engine the steam had forced up the piston, and upon the condensation of the air in the piston by cold, the atmospherial pressure brought it back again. Watt had introduced other improvements, among which were the injector, the governor, and the cut-off. There has never been in the history of inventions since the world began any machine or apparatus which was so perfect as it left the hands of the inventor, as the steam engine was when it left the hands of Watt. You may stand to-day beside the most stupendous piece of steam engineering in the world, and you will see connected with it no essential change from his invention. It is true that he had no machinery or tools competent to reach the exact results that we can now produce. He had no turning lathes, boring-machines, planing machines, but all was done by a cold chisel, the hammer, the file, etc.; and the marvel is that he produced such results as he did. I have often thought with what delight that great man would stand upon one of our first-class steam frigates, or by one of our first-class pumping engines, such as are used at the reservoirs in Brooklyn and New York, and see the perfection, the finish, and the smoothness of the work, a result possibly solely due the genius of Watt, because without that power we could not have had the apparatus with which to apply it. Professor Silliman next proceeded to illustrate the irregular expansion of water near the freezing point. He filled a vessel with water at 55° and surrounded it with ice and salt to reduce its temperature. A freezing mixture is composed of two solids having an affinity for each other, but which cannot unite without becoming fluid; and in order to become fluid a large amount of latent heat is required, which must be borrowed from the surrounding substances. In the vessel of water he immersed two thermometers, one near the top and the other near the bottom. As the temperature of the water fell, the temperature of the lower thermometer descended to 39½°, and there remained stationary, while the upper thermometer continued to fall, and at last reached the freezing point. Why does not that system of currents keep going on like the boiling of water in a flask, so that the whole shall freeze at the same time? That is just where this wonderful exception takes place, and it is the great delight of a devoted mind to believe that the exception is a part of the original intention of the Great Architect in the formation of the world in adapting it to be inhabited by human beings, because we may readily believe that, except for this irregularity in the expansion of water the world would be uninhabitable. At the temperature of 39½° the very contrary effect takes place, and the water begins to expand, it increases in bulk, and consequently becomes specifically lighter, and, like a cork, floats upon the surface, or immediately beneath it; so that you will have the surface of the water cooled down to 32°, and converted into ice, and yet that freezing does not extend much below the surface. You rarely find in the coldest winter that ice is formed more than two feet thick. If you observe a caldron of molten iron as it cools, does it solidify first on the top? No. Does a mass of lead in a ladle solidify at the top? No; but equally at the bottom. In most cases the solid, which is the result of congelation, is heavier than the fluid in which it is formed and sinks to the bottom, whereas in the case of the water the solid is much lighter than water. We have here another exception that the ice which is formed is lighter than the water and it floats upon it. When we see an iceberg from 100 to 200 feet above the surface of the sea we know that for every foot of elevation above water there are 10 feet of depression beneath the surface; so that what we see is only one eleventh of the whole bulk. Lake Superior has a uniform temperature of about 40°, and beneath the surface in the Winter, in any of our lakes we shall find water at about that temperature. This is an important fact with reference to the inhabitability of our globe; because, you observe, that if water as it solidified continued to shrink and to become heavier, the whole mass would become frozen in a single winter so that no summer would be long enough to melt it, and eternal death would rest upon the surface of the globe. In the freezing mixture Professor Silliman inserted one end of a closed tube, containing vapor, and containing water in a bulb at the upper end, and the condensation of the vapor from the abstraction of the heat by the freezing mixture, in its turn, abstracted the heat from the water in the bulb above so rapidly that it was frozen solid.

He then illustrated the heating of houses by hot water pipes, showing that the heated water would rise, from its being lighter than not heated, and thus a circulation of water never heated above the boiling point, and therefore not liable to burn the atmosphere by charring particles of dust in it, would be constantly maintained. He proceeded to speak of the chemical constituents of water, being two atoms of hydrogen and one of oxygen. These two gases which have never been reduced to liquid form by mechanical power, would readily unite by the magical power of chemical combination, and form that wonderful matter which we call water. The ancients in their philosophy said the earth is composed of four elements, earth, water, air, and fire. We may interpret this under the light of modern science thus: Earth is the solid, water is the liquid, air is the gaseous condition of matter, and fire is the force that converts them all from one condition into the other. We have in water the solid ice, and permanent as granite, so long as the temperature is unchanged. We have in water an inelastic, mobile, transparent fluid. We have in water the perfectly elastic invisible gas which we call steam. Although we cannot by mechanical means compress the gases which constitute water into liquids or solids, yet by their union we can condense them into water, and we can by their union produce the highest degree of artificial heat which it is in the power of man to produce mechanically. Two vessels, one containing hydrogen and the other oxygen gas, were connected with a single tube. The former being turned and lighted produced an ordinary flame (the gas not being pure), but upon turning on the oxygen gas the two produced a much whiter and more brilliant light. Placing in the blaze a mass of cold iron, the water produced by the union of the gases was condensed upon its surface, falling from it in drops. He next placed in the blaze a slender bar of steel, and the heat was so great as to burn the steel, scattering it in a shower of intensely brilliant sparks. These two elements, by their collision, produce an amount of heat, as a mode of motion which is beyond that which we can produce by any other artificial means which is purely mechanical. We can, indeed, by this voltaic current, acting chemically, produce a current of electricity in the focus of which everything which can be melted, melts, and everything that melts volatilizes. That, as I have said, is a mode of motion. It can be converted into motion, and motion in like manner can be converted into heat. We are living upon a ball of matter moving through space with planetary velocity, and if that mechanical motion with which the earth is moving in its orbit could be suddenly arrested the amount of heat which would be equivalent to that mechanical motion would not only be sufficient to melt the whole earth, but to actually volatilize it into the nebulous state again; nay, it would be sufficient to volatilize six worlds as large as that which we occupy. I am prepared to show you some wonderful experiments with the spheroidal condition, but I have not time, and I will close this already too long lecture with a single illustration more.

There is an erroneous idea that steam-boiler explosions are produced by the formation of a certain gas. The only gas is steam, and it is only because there is too much steam. There is often too much steam because there is too little water; and also owing to the fact that when water comes into contact with superheated surfaces of iron it is suddenly converted with great violence into steam, sufficiently powerful to tear the strongest metals. Chemists utterly deny that there is any foundation whatever for the popular notion among mechanics that there is produced, in cases of explosions of steam-boilers, a kind of gas.

The lecture of Professor Silliman was illustrated by a great variety of experiments, many of which were received with much applause.

FACTS CONCERNING THE FINANCIAL CONDITION OF THE SOUTH.

The following facts concerning the financial condition of the South were furnished to us by the manager of a leading journal, published at Mobile, and are doubtless substantially correct.

During the war, and while Confederate currency was abundant, the planters entirely paid up their debts.

For the two years subsequent to the war, but little capital was embarked in trade in the South, and hence but little credit could be extended to the planters, and they were forced to work through, economically, with the little specie currency they quite generally had stored away. That they might live within themselves, the attention of planters was largely directed to the growth of breadstuffs and meats, and more corn, wheat, and bacon were made in the South than ever before.

During this present year a fair crop of cotton has been made, and generally made with provisions and feed of home growth, so that the planter has received but small advances and is not now in debt. From the high price of our staple—cotton—more money will be distributed in the South this year than ever before, not excepting the year of the great crop—1860.

This year's cotton crop will net the planters of the South the immense sum of *two hundred and fifty million dollars*.

The crop of Mobile alone will bring not less than *thirty million dollars* to be distributed from that point.

The entire debt of the South, abroad, and in the North and West, is less than fifty million dollars.

The vast sum of more than *two hundred million dollars* will be loose money in circulation in the Cotton States.

The restoration of political quiet, following the determination of the Presidential election, will cause a confident free use, circulation, and expenditure of all this currency. In the old time the planter in the South used the gains of each year (in fact was generally a year ahead in debt to his factor) in the purchase of more negroes or more lands, and hence had but little or no money to expend for luxuries and the merchandise of trade.

Now there are no negroes to buy.

The principle of small and well cultivated plantations is accepted, and no planter wishes to buy more land.

The gains of the planter will now be invested in the purchase of improved farm implements, household furniture, articles of comfort and luxury, dry goods, clothing, books, sewing machines, pianos, and other musical instruments, etc., etc.

The trade of the South will now be an exceedingly rich one. While the great West is now undergoing hard times incident to the low prices of breadstuffs, the South will be prosperous in the wealth of her staple, now bringing the most profitable prices.

No part of the country to-day offers a richer field for the enterprising merchant and manufacturer than the Cotton States. These views are plain and simple, and will present themselves with force to every shrewd observer and thinking man.

The man who sees this condition of things aright, and takes immediate advantage by placing himself before the people of the South with his business properly advertised, cannot fail to secure a lucrative trade and large returns of profits for his expenditures.

The Great Floating Dock for Bermuda.

This enormous maritime structure is now completed. The following is a concise history and description of the gigantic undertaking:

The British government, being impressed with the absolute necessity of providing dock accommodations for the iron-clad ships and other vessels constituting the North American and West India squadron, determined some time since to build a capacious floating dock of iron for service at Bermuda. When Admiral Sir Alexander Milne commanded on that station he pointed out to the Admiralty this great want. During the past ten years many iron-clads have been added to our fleet; and although most of these have been payed below water line with various compositions, the hulls of most ships after service afloat were exceedingly foul. The iron men of war on the North American and West India stations were no exception, but after a shorter or longer time afloat were more or less covered below water-line with barnacles, weeds, and parasites, thus impeding the speed of the vessel and causing other annoyances.

The want of a dock in the West Indies, in which a ship could be laid up for cleaning the bottom and for necessary repairs, induced the government to construct a monster floating machine at a cost of nearly £250,000. This dock was built by Messrs. Campbell, Johnson & Co. of the Albert Works, Silvertown, from plans patented by Mr. Campbell, and adopted for the Royal dockyard at Bermuda by Colonel Clarke, R. E. the government director of works. This great iron floating structure, the largest in the world, is of the following dimensions: Extreme length, 381 feet; width inside, 83 feet 9 inches; width over all, 123 feet 9 inches; depth, 74 feet 5 inches. The weight of the dock is 8,350 tuns, and it is asserted that a vessel weighing 10,000 tuns or more may be easily lifted, making the total approximate displacement about 19,000 tuns.

The dock is U-shaped, and the section throughout is similar. The iron-clad Bellerophon, and ships of similar and of smaller size, may be easily received into this capacious hollow, and when once the dock is in position ships forming the squadron on the West Indian station will no longer be subject to great and ever-recurring inconvenience. It is built with two skins fore and aft, at a distance of 20 feet apart. The plans show that the space between the skins is divided by a watertight bulk-head, running with the middle line the entire length of the dock, each half being divided into three chambers by like bulk-heads. The three chambers are respectively named "load," "balance" and "air" compartments. The first-nameb chamber is pumped full in eight hours when a ship is about to be docked, and the dock is thus sunk below the level of the horizontal bulk-heads which divide the other two chambers. Water sufficient to sink the structure low enough to admit a vessel entering is forced into the balance chambers by means of valves in the external skin. The next operation is to place and secure the caissons and eject the water from the "load" chamber. Then the dock with the vessel in it rises, the water in the dock being allowed to decrease by opening the sluices in the caissons. The dock is "trimmed" by letting the water out of the "balance" chamber into the structure itself. The inside of the dock is cleared of water by valves in the skin, and it is left to dry. When it becomes necessary to undock the vessel the valves in the external skins of the "balance" chamber are opened in order to fill them, and the culverts in the caissons are also opened, and the dock sunk to a given depth. From keel to gunwale nine main water-tight ribs extend, further dividing the distance between the two skins into eight compartments. Thus there are altogether 48 water-tight divisions. Frames made of strong plates and angle iron strengthen the skins between the main ribs. Four steam engines and pumps on each side—each pump has two suctions, emptying a division of an "air" chamber—are fitted to the dock, and these also fill a division of the "load" chamber. When it becomes necessary to clean, paint, or repair the bottom of the dock it is careened by the weight of water in the load chambers of one side, and the middle line is raised about five feet out of the water. This gigantic structure is a splendid specimen of workmanship; and, although intrinsically ugly, the skillful toil of the artisan for two years is manifest in the *tout ensemble* of the first great floating dock ever put together in England.

Two other vessels of this kind, have, we believe, been built and sent abroad—one to Cadiz and another to Callao—in pieces; but this is the only dock fitted in this country ready for transport in a complete condition.

The question has been asked whether it would not have been judicious to construct an ordinary dock at Bermuda; but when it is remembered that the island itself is only a coral reef, and that no good foundation can be got, the answer is directly given to this query. Then arises a surmise whether such a leviathan machine could successfully encounter bad weather in the high seas. There is no reason to suppose that the dock would founder, because it can be made as tight as a bottle; and should it get in the trough of a heavy sea, end on, the water would enter at one end and flow from the other. It would, in fact, live on the wave like a well corked bottle. The vessels towing it out would have to keep its head to the gale, and avoid collision; then there would be no risk and little danger.

The Bermuda dock has an enormous rudder, and this has lately been increased considerably in area at the after-end by a large number of planks, in order to give more steerage power. Its cutwaters are formed like the bows of a barge, to divide the water, and by that means diminish the resistance, and enable the dock to be more easily towed."—*London Scientific Review*.

Interesting Planetary Discoveries.

The planet Mars is the only object in the whole heavens which is known to exhibit features similar to those of our own earth, and the accumulated explorations and discoveries of astronomers during the last two hundred years have resulted in the construction of a globe representing the characteristics of this planet as astronomers believe them to exist. At a recent meeting of the Astronomical Society of England, a globe of Mars was exhibited, on which lands and seas were depicted as upon an ordinary terrestrial globe. By far the larger portion of these lands and seas were laid down as well known entities, respecting which no more doubt is felt among astronomers than is felt by geographers concerning the oceans of our own globe. An interesting description of this globe appears in *Fraser's Magazine*. To the lands and seas, developed in the planet, are applied the names of those astronomers whose re searches have added to our knowledge on the subject. Each pole of Mars, it seems, is capped with ice, which varies in extent according to the progress of the seasons. Around each cap is a polar sea, the northern sea being termed the Schroter Sea; the southern, Phillips Sea. The equatorial regions of Mars are mainly occupied by extensive continents, four in number, and named Dawes Continent, Madley Continent, Secchi Continent, Herschel I (Sir W.) Continent. Between Dawes and Herschel Continents flows a sea shaped like an hour glass, called Kaiser Sea, the large southern ocean out of which it flows being denominated Dawes Ocean. Between Madler and Dawes continents flows Dawes Straits, connecting a large southern ocean and a northern sea, named after Tycho Herschel continent is separated from Secchi continent by Higgins inlet, flowing from a large southern sea, termed Maraldi Sea. In like manner Bessel inlet, flowing out of Airey Sea (a northern sea) separates the Madler and Secchi continents. Dawes Ocean is separated into four large seas, and large tracts of land lie between, but whether they are islands or not is not certain. In Delarue Ocean there is a small island, which presents so bright and glittering an aspect as to suggest the probability of its being usually snow-covered. These seas, separated by lands of doubtful extent, reach from Delarue Ocean to the south pole.

One of the most singular features of Mars is the prevalence of long and winding inlets and bottle-necked seas. These features are wholly distinct from anything on our earth. For instance, Higgins inlet is a long, forked stream, extending for about three thousand miles. Blesse inlet is nearly as long, and Nesmith inlet still more remarkable in its form. On our earth, the oceans are three times as extensive as the continents. On Mars, a very different arrangement prevails. In the first place, there is little disparity between the extent of oceans and continents, and then these are mixed up in the most complex manner. A traveler, by either land or water, can visit almost every quarter of the planet without leaving the element in which he began his journeyings. If he chooses to go by water he could journey for upward of thirty thousand miles, always in sight of land—generally with land on both sides—in such intricate labarynthine fashion are the land and seas of Mars intertwined.—*Boston Journal*.

Vesuvius on the Rampage.

A correspondent of the *Pall Mall Gazette* has been to look at Vesuvius, to see for himself what the eruption of a volcano is like. He finds it sufficiently terrible. He went up the mountain and stood upon the lip of the crater, and peeped into the roaring abyss on one side, taking advantage of a strong wind that was driving all the suffocating steam and vapor to the other. Presently the eruption came:

It does not consist, as the pictures necessarily lead one to suppose, of a continuous shower at all. Still less does it consist of a continuous shower of black ashes shot out from a fire blazing on the top of the mountain; it is rather a series of explosions. But the roar and glare of the great abyss is continuous. You look into the pit, and though you see no actual flame, yet its sides are in a state of constant incandescence; from the mouth of it there roars up incessantly a dense cloud of steam; and in the depths of it below you hear the noise of preparation for the outburst that is next to come. Then you hear a sharper crackel, and then, without further warning, follows a loud explosion, which shoots into the air a torrent of white-hot missiles of every shape and size. So enormous are the forces at work, that not only small pieces of stone and sulphur, such as you might carry away as mementos of your visit, but huge blocks of mineral, each enough to load a railway ballast wagon, and all in a state of perfectly white heat, are tossed up as though they were so many cricket balls. The explosion lasts, perhaps, no longer than a minute; and then there is a cessation of some seconds, with the noise only of internal preparation once more, after which the explosion is repeated.

Printing in Colors. A Step in Advance.

We have before us a copy of a new illustrated weekly, the *Western World*, a popular literary and family paper, published by French & Wheat, 13 Park Row, New York. We give this new enterprise a cordial welcome and predict for it large and increasing public favor. The contributions to the number before us indicate thorough acquaintance on the part of the publishers with the tastes of the American public. The stories are chaste and entertaining, the miscellaneous matter selected with great care and judgment, and the editorial matter of a high order in subject, thought, and style.

But the most striking features of this publication are its illustrations, heading, and border. These are printed in colors by a patented process by which the different colored impressions are given to the paper by a single feeding. The process is still in its infancy, yet, notwithstanding the difficulties which attend the earlier stages of any improvement, the effects produced are novel and striking, approximating very nearly to chromo-lithography. The general appearance of the paper is very pleasing, and this method of printing in colors must be considered a decided step in advance.

OBITUARY.

We regret to announce the death of Prof. Wm. E. Jillson, which occurred at his home in Jamaica Plain, Mass., on the 29th ult. Mr. Jillson will be remembered by inventors and others who had occasion to consult the Patent Office Library, from 1860 to 1865, as its accomplished librarian. In 1865 he resigned this position to accept one in the Boston Public Library, where he remained up to the time of his death. He was considered one of the most accomplished bibliographers in the country.

THE Pittsburgh *Dispatch*, in speaking of some of its more useful exchanges, says:

Another paper, of a very different class, which we always read with interest, is the SCIENTIFIC AMERICAN, the best journal of the kind published. It not only abounds with information, of the most useful kind to inventors and mechanics, but its general articles are always well written and full of interest. The number before us is one of the best of the paper which we have yet read, and shows that the publishers are up to the spirit of the times in the way of progress and improvement.

WE are indebted to Messrs. E. R. Jewett & Co., Buffalo, for proof sheets of engravings, designed to illustrate the Patent Office report for 1867. We have so often spoken in praise of these artistic illustrations, that it is unnecessary now to say more than to commend the great fidelity with which these drawings exhibit the real point upon which the claims to a patent are based.

Improvement in Engine Governors.

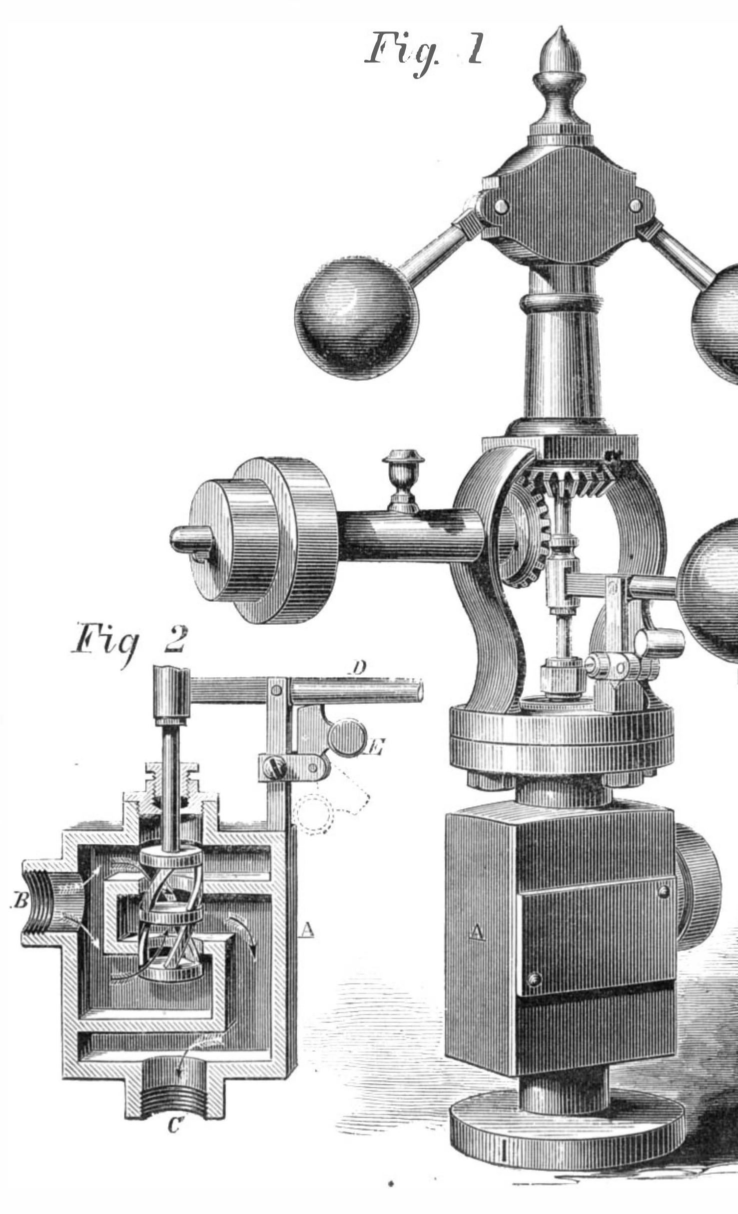
For all stationary engines the governor is absolutely necessary. So much importance is attached to its proper action that it is not surprising that it has been the subject of numerous patents. The governor, to be effective under all circumstances, should act quickly, if not instantly, when resistant force is suddenly added to, or suddenly thrown off the engine; it should maintain an equable speed under occasional and moderate variations in the force to be overcome, and should entirely close the inlet valve should the belt that drives the governor be thrown off or break. It would seem, from an examination of the governor shown in the engravings that these requisites are fully met in this improvement, and this opinion is borne out by letters from the managers of concerns in which this governor has been used for months.

A brief description of the invention aided by a reference to the engravings, will enable the engineer or mechanic to easily understand its construction and operation. Fig. 1 is a perspective view of the governor with its attachments complete and Fig. 2 a vertical section of the valve chamber and its parts. The valve chamber, A, may be either rectangular, as seen, or of other external form, as may be desired. Interiorly the chamber is divided by a partition of an angular S-form, the horizontal portions of which are connected by vertical walls and by the walls of the valve chamber. The two upper horizontals of the diaphragm are bored to form seats for the valve, which consists of three disks attached to the upright valve stem and connected by wings or ribs, being either straight bars or of a spiral form; the latter preferable, as the movement of the valve or combined disks is similar to that of a piston in a cylinder, and the spiral form of connection insures an even bearing and wear against the sides of the apertures forming the valve seats.

In the sectional engraving the valve is shown open. B being the inlet for the steam, the arrows show the directions the steam will take, when admitted, and its escape through the passage, C, to the steam chest. It will be seen that by the provision of double ports for the valve a much smaller valve than is usually employed can be used, which, of course, is an improvement, as its movement can be much more easily governed. The inventor says that the area of an ordinary governor valve of two inches diameter is 3·1416 square inches and that this area may be obtained by the use of one of his improved valves of only one and a half inches diameter.

The valve stem coupling is connected to the governor stem by the ordinary swivel. In this coupling is a slot to receive the end of a lever, D, carrying an adjustable weight seen in Fig. 1, the fulcrum of the lever being on a stand rising from the valve chamber. It is evident that this weighted lever may be used to give a variety of speeds to the engine, or to adjust the speed to the number of revolutions. It is plainly seen, also, that the weight of this lever, when not counterbalanced by the centrifugal motion of the governor balls, will effectually close the valve and prevent the inlet of steam. Thus, if the governor belt should break, or be suddenly thrown off, the valve would close and the steam be cut off. So, also, when the engine is stopped no steam could reach the steam chest and cylinder through the valve chamber. To keep the valve open when about to start the engine, a weighted catch, E, is used to hold the lever, D, up. Soon, however as the velocity of the governor is sufficient to raise the balls and the lever, the catch is released, and falls by its own weight to the position shown in the dotted lines at E, Fig. 2, leaving the lever ready to act in case of accident.

Patented June 9, 1868, by William Bellis, whom address for additional particulars at Richmond, Ind.



BELLIS' PATENT ENGINE GOVERNOR.

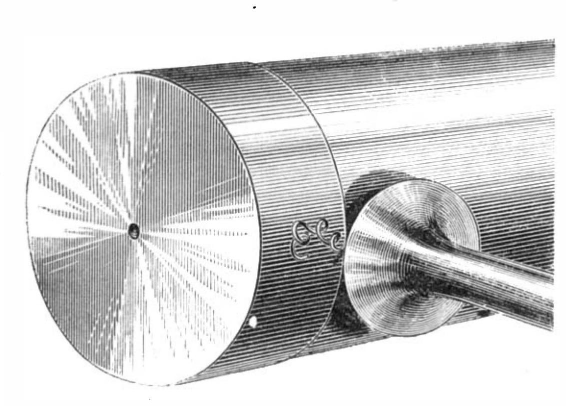
MECHANICAL PRACTICE AT HOME---THE FOOT LATHE.

Foremen of machine shops get their best material for apprentices from the farm. In this statement all managers of shops who have had a lengthy experience will coincide. Why is it? These farmer boys perhaps never saw a machine shop or foundery, yet they betray an aptitude and a liking for the work of the machine shop seldom shown by the city bred boy. To be sure, the lad whose early life has been spent in a manufacturing town or village where the hum of the spindle and the clatter of the loom, or the detonations of the hammer daily assaulted his ears, takes readily to the duties and discipline of the machinist's apprentice; yet frequently the farmer's boy becomes the most intelligent and successful workman. We answer our question by the simple statement that farmers' boys are compelled to practice mechanics in their daily labor. It is not always convenient to stop work and run or ride to the blacksmith's shop whenever any portion of a implement gives out by breakage or wear; and the farmer's boy is compelled to repair the break, often by the use of very inferior tools. He is largely employed in mending, repairing, and making on rainy days and in winter. Even his playthings are more frequently made by himself than bought at the "store." He thus becomes, insensibly perhaps, a mechanic; at least he learns the first lesson of the mechanic's apprentice, the use of tools.

Every farmer should have a shop room fitted up with such tools as are used by the carpenter, joiner, machinist, and blacksmith, or with those that would be valuable in making repairs. Above all, we consider a good foot lathe very desirable. It would be impossible within the limits of a newspaper article to merely notice the advantages of this machine and its varied uses. A good foot lathe costs from sixty to one hundred dollars and the money is well expended in the purchase. Articles of use and ornament made of wood, ivory, and metal may be turned out by the foot lathe convenient for use in the house or on the farm. The practice on the lathe is one of the most fascinating pastimes for a stormy day or an unemployed evening. Apart from its use in making and repairing, the foot lathe is a pleasant companion for the business haunted and brain weary. One who adopts it as a companion of his leisure hours will soon become an adept, and the more he uses and becomes acquainted with his machine the better he will like it. He will be surprised at the number and elegance of the little articles of use and ornament he can produce from the rough material, and at the pleasure that the practice of a mechanical art will afford.

HAND TOOLING---THE BUTTON TOOL.

There is little doubt that the practice of hand-tooling for turning metals is not so extensively practiced in this country as it might be with benefit. The superiority of hand tooling over the absolute action of the fixed tool in the engine lathe,



under some circumstances, is as apparent as is the hand turning of wood over the work performed on the automatic lathe. In our experience as a practical workman we derived great benefit from our knowledge of the use of hand tools. There are various forms of these tools, and they can be made from worn out files or from steel bars, as may be desired. The ordinary triangular file makes a very handy turning tool—in fact it may be ground in three forms, each of which are useful in particular cases. The ordinary flat file is very useful in smoothing or finishing. A square file or square bar, ground at an angle across the corners, is a valuable tool. We show, however, one not so frequently employed as its merits deserve. It is called the "button tool," from the form of the head or cutting portion. (The artist has made the head a graceful bell shape, which is not absolutely necessary). The tool is made by upsetting the end of a steel bar or rod and forming the head in a die. The shape of the head is precisely like that of a common wood screw, and the shank being cylindrical no obstruction to its gradual rotation in the hands of the workman is offered. The tool being fastened in a common chisel handle engages with the work as shown, and while the shank bears upon the rest the hand keeps it against the work and steadily rotates it. In sharpening it the face of the tool is placed against the grindstone and is turned gradually until a perfect edge is secured around the whole circumference. Further description is unnecessary.

CONDENSATION IN STEAM PIPES---LOW PRESSURE.

A correspondent says: "I notice on page 375, last volume, your three line article on steam pressure in the boiler and cylinder being necessarily unlike. How much is the allowance for friction and condensation in the pipes? Please show the probable and actual differences between boiler and piston pressure." Our correspondent misquotes our statement, which was: "Steam pressure in the boiler and steam pressure on the engine piston are not necessarily alike. Allowance must be made for condensation in conveyance by pipes." Our object in stating this self-evident truth was to intimate to engineers and others that in estimating the pressure upon the piston of the engine, as that shown by the gage on the boiler, they may not be correct. Indeed, they are frequently far out of the way. The condensation of the steam in the connecting pipe between boiler and engine is more or less, according to circumstances. If the steam is led through a pipe undefended from the atmosphere, the pipe being fifty or a hundred feet long, as is sometimes the case, it is evident that quite a large percentage of the steam will be condensed, and reach the cylinder in a state of mere vapor, the whole body of steam being lowered in temperature, and its pressure consequently diminished. But if the steam is taken directly from the boiler into the cylinder, as in those portable engines where the engine and boiler are closely connected (the cylinder attached to the top or side of the boiler, and the connecting pipe being only a few inches long), the loss of heat and consequent pressure would be inappreciable, and, therefore, the boiler pressure could be safely taken as an indication of that in the cylinder.

Our correspondent's question as to the amount of condensation and friction is sufficiently answered by the above. As no two circumstances are alike, no unvarying rule can be given; it must be left to the judgment of the experienced engineer or millwright. It is safe, however, to observe the following suggestions, or to approximate to them: Place the engine as near the boiler as possible. Use steam pipe of generous size, with the elbows of much larger transverse area than the straight pipe. If gates are used, let them have large apertures, so as not to "cramp" the steam, and, finally, insulate the steam pipe thoroughly by good non-conducting lagging, or by boxing it with sawdust, tan, or some similar substance. It is well, also, to have a little drip pipe, through which the condensed steam may be drawn off before starting the engine, so as not to depend entirely on the cylinder pet cocks. The working of water in a cylinder is terribly straining.

The Herring Fishery of 1868.

Dr. Louis Feuchtwanger has lately returned from a trip "Down East," and sends us some facts in regard to the eastern herring fishery. He says this season has been one of the most prolific of herrings known for many years, 50,000 herrings being taken at one haul. On the 12th of October 80 hogsheads of herrings were taken at one haul and 30 hogsheads two tides before. Every two hogsheads will yield one barrel of fish oil worth in the market $22·50 per barrel, the oil being used in currying leather and for mixing with other fish and lubricating oils. Beside this product the remains of five hogsheads of fish will produce one tun of pumice or fish guano, the best fertilizer known, and used to mix with inferior guanos and the superphosphates of the various brands, and worth by itself $20 per tun. If mixed with sulphate of soda or even plaster (sulphate of lime) intended for absorbing the ammonia produced by their decomposition, it is not excelled in value by the best Peruvian guano. These facts prove the profitableness of this branch of industry.

The Dunderberg Not a Failure.

The ram, *Dunderberg*, which was sold to the French government a year ago last summer, has withstood batteries of adverse criticism, to which, unlike the more solid compliments of an armed enemy, she was unable to reply. In addition to the attacks made upon her when she was the property of her builder, it was stated, after her sale to the Emperor of the French, that she was a mere tub for sailing qualities, and a mere eggshell for defensive purposes. Time and trial have, however, refuted one of these calumnies, as we learn that the *Rochambeau neé Dunderberg* performs her fourteen measured miles with ease. We are glad to hear that the reputation of her enterprising builder has been sustained.

Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents,121 Nassau street,New York.
☞ "The New York News Company," 8 Spruce street.
☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.
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VOL. XX., No. 1....[NEW SERIES.]....*Twenty-fourth Year.*

NEW YORK, JANUARY 1, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

THE EVENTFUL YEAR OF OUR LORD 1868.

From whatever point of view we consider the year just passed into history, we are struck with the number of important events that have been crowded into its annals. With its political or religious aspects, although they present much food for profitable thought and study, it is not our province to deal. The progress of science, and the remarkable physical phenomena so numerous, and in some instances so appaling, during the twelve short months that have rushed past us, give ample scope for a brief and profitable retrospect.

The year 1868 will henceforth be known as the earthquake year. History has not on its records a period of such universal terrestrial convulsion as the one just left behind us, and scarcely one of greater disaster from this cause. The eruption of Vesuvius, and the excited state of many other volcanos throughout the world, indicate that the mighty forces to which these phenomena are due, are still at work. Whether their energies are in such measure exhausted that no further immediate danger is to be apprehended, is yet undetermined. These terrible visitations are gradually changing the physical aspect of our globe; and from them we can gather some idea of the power of the immense volcanic disturbances, which, ages ago, threw up our vast mountain ranges and engulfed whole continents.

No less grand and impressive have been the celestial phenomena of the year. The great solar eclipse, possessing in some respects features of greater interest than any that has occurred for a long time past, or that will occur for a long time to come, has been not the least of these remarkable occurrences, both on account of its special peculiarities, and the results which have been obtained from organized observation. Add, to this the splendid meteoric shower of November, and we may well say that the heaven above and the earth beneath have been prolific of wonders.

The progress in the most mighty undertakings which the world has ever witnessed is no less remarkable. The most gigantic railroad enterprise ever attempted has been pushed this year almost to completion. The Suez canal now almost joins the Mediterranean to the Red Sea, while during the year a movement has been initiated for the construction of a similar work across the Isthmus of Da ien, which will unite the two great oceans. A new sub-Atlantic telegraph of greater length than any heretofore attempted, has been made and will soon connect the two continents, to be followed, no doubt, by others of greater magnitude. It has also been the subject of serious contemplation to lay a cable between the Pacific coast and China, and we would probably hazard little in predicting that some even now old men will live to see that work accomplished. Never has the earth seen a period of greater enterprises; never before has civilization made such triumphant advances.

The discoveries and improvements in the sciences and the arts have been numerous and important. To review them and specify them as they demand would fill a volume. A glance at the index of the volume we have just closed will show the great variety of subjects upon which scientific minds are now at work—not in mere speculation, but in actual and accurate experiment. Almost daily, nature responds to some bold inquiry of this kind, and a new truth is born to science.

As this article meets the eye of our numerous friends and readers, the congratulations and kind wishes of friends will be mutually interchanged upon the advent of the new year. That the year 1869 will be as fruitful of progress and as promotive of the welfare of the entire human race, as the eventful year that has passed, is our prayer, while we beg to unite with other friends in wishing each and all a "Happy New Year."

INSURANCE---DUTIES OF COMPANIES AND INSURERS.

The occasional if not frequent litigations between insurance companies and policy holders are calculated to do great injury to both. That company which soonest and quietest adjusts its affairs with a holder of a policy after his loss is always the most popular. The fact of an early payment of the amount is heralded by the recipient, and given currency in the newspapers, making one of the best, although gratuitous, advertisements the company could have. But litigation before a jury or a suit before a referee does more damage to the company than can be offset by their success in that particular case, and injures the business of insurance generally.

Insurance is a perfectly legitimate business, and its institution has done much more to nurse and protect enterprise in building, manufactures, and commerce than is generally supposed. The Chicago *Insurance Chronicle* gives an idea of the history of insurance that may be of interest to our readers. It says that the earliest recorded application of the principle was in marine insurance, which was the invention of merchants and ship owners engaged in the commerce of the Mediterranean, somewhere about the twelfth century. Its object can scarcely be more clearly and fully set forth than it is in the language of the English statute of 1691, which declares that, by means of insurance, "it cometh to pass, upon the loss or perishing of any ship, there followeth not the undoing of any man, but the loss lighteth rather easily upon many than heavily upon few, and rather upon those that adventure not than upon those that adventure; whereby all merchants, especially of the younger sort, are allowed to venture more willingly and freely." It was not long before the same principle was applied to the insurance of buildings, and so to the protection and encouragement of trade.

Further on the writer says; "It is vain to argue that insurance was designed for the use of business, and not business for the use of insurance. Insurance is governed by certain laws, which cannot be violated with impunity. The premium must be equal to the average risk, and exceed it by a sufficient margin to cover the necessary expenses of conducting the business, or bankruptcy is inevitable. This ideal may not be always attained with mathematical precision, but the departures from it will oscillate within ever narrowing limits. If the premiums are calculated too high, the business will decline; if too low, impending ruin will soon teach the insurers their error. It is folly to consider the interests of the insurers and of the insured as distinct. It is madness to regard them as inimical. Insurance is the friend of industry and thrift everywhere. Despite the crudities of its present classification of hazards, that classification is the result of long experience and careful observation, and is established as much in the interest of the insured as of the insurer. It cannot be materially changed without defeating the very objects of insurance. The practical question, therefore, in the case before us is this: If the present rates are prohibitive to the manufacturer, and yet unremunerative to the insurer, what is the remedy? What, in the name of common sense, but this—the co-operation of both in the search for some sufficient safeguard, some measure of protection, that shall reduce the hazard and so reduce the rate? In this search they have each an equal interest. The minimum rate, consistent with safety, is the result which the underwriter seeks, and it is better for the manufacturer to recognize this fact and do all in his power to diminish the hazard, than to seek to reduce the cost of indemnity by means which, if successful, must surely result in the destruction of the indemnity itself."

We would suggest, in addition to the search for a safeguard, honesty in the insured and the insurer. So long as seekers for insurance prefer to overrate the value of their property and pay the additional premium, and the companies, for the sake of that additional premium, or increased amount, will issue a policy on property the real or market value of which they do not understand, or care to ascertain, so long will insurance be simply a contest of sharp practice between insured and insurers, and suits at law will follow losses and a demand for payment. Although both parties are to blame for this state of affairs, a little consideration will show that the *onus* of the blame rests upon the insurer. It is his business to ascertain the value of the property insured. Men generally believe, and honestly too, that what is theirs possesses some peculiar value, and they will estimate their possessions at a higher figure than similar property held by their neighbors. This is natural, and therefore in some measure, excusable. But the insurance agent should use his own judgment, aided by a personal inspection of the property to be insured and the opinions of disinterested but competent parties. And the agent should have a theoretical, if not practical, knowledge of the nature of the business carried on in the buildings for which an insurance is asked. An exhibition of this knowledge would serve as a restraint on the party who desired the insurance, and aid in correcting his mis-statements whether honestly or fradulently made. Instead of employing as an agent or solicitor a person who has merely the gift of fluency of speech and personal presentability, our insurance companies would do well to have agents for each class of their risks who are experts by reason of their familiarity with the nature of the property on which they recommend risks to be taken. Improper representations on either side and consequent controversies in case of loss would thus be avoided.

WILL STEAM IGNITE COMBUSTIBLE SUBSTANCES?

The idea that heating buildings by means of steam pipes completely prevents all danger from fire, we do not believe is correct. When we know that the heat generated by a hydrocarbon in combination with a combustible fiber will produce combustion, as has been so often proved, and that a fibrous material saturated with oil will, if exposed to the sun's rays burst into a flame, it follows that a greater degree of heat, whether produced by steam or any other agency, may produce like results. Experience has proved that a long exposure of wood to a temperature not exceeding that of boiling water, or 212 deg., brings the wood into a condition very favorable to ignition; how much more should it be accepted as a truth that long exposure to pipes conveying steam at a temperature of from 350 deg. to 400 deg., should render the combustible substance liable to ignition. We have on our table specimens of boiler lagging, of pine wood, inclosing the steam space and defended by a sheet iron jacket, thus protecting them from the oxygen of the atmosphere, that are reduced to the condition of porous charcoal, lighting as readily as our old-fashioned tinder merely by the contact of a spark. Every engineer must have noticed in his experience the inflammable condition of the wood through which a steam pipe passed, or on which it rested, if they had remained in contact or contiguity for a period of a few weeks. Every engineer of lengthy experience and close observation also knows that it is possible to ignite combustible or inflammable substances by the direct impact of steam. Cases have been recorded where dry wood was ignited by escaping steam at a distance of not less than thirty yards from the boiler; and we know, personally, where, as an experiment, we lighted oil-saturated cotton waste and dry pine wood by the steam from a boiler at a distance of twelve feet, the boiler pressure being at the time only 95 lbs., temperature, by Regnault 335 deg. The materials burst into flame in a few minutes.

The ordinary way of conducting steam through buildings, factories, shops, etc., from the boiler, is to lead it through a series of parallel pipes, connected by bends or cross pipes at the ends and suspended on iron hooks or brackets attached to upright wooden cleats. These brackets hug the pipes closely to the wood, but they leave spaces between the pipes and wood for the lodgment of the dust from sweepings and the particles held in suspension by the atmosphere of the room. These particles are simply a form of tinder, calculated from their lightness and combustibility to readily ignite. When it is considered that the mere heating of a stick of pine wood, however much seasoned, will compel it to give out an inflammable vapor, it will readily be understood that dry wood and the "fluff" that settle from the atmosphere of a cotton factory or sawing and planing mill are in the best condition for ignition even at low temperatures.

ABOLISHING OF THE FRANKING PRIVILEGE.

We are happy to learn that Senator Ramsay has reported a bill from the Committee on Postoffices, and Post Roads, recommending the abolishing of the franking privilege, and we are glad to see that the senator personally recommends its adoption.

The abuse of the franking privilege has become so general that the revenue of this department is greatly impaired in consequence, and that, too, by our very lawmakers, who should be the most scrupulous in observing the spirit as well as the letter of the statute.

If congressmen would limit their franking operations to their own business there would be less cause of complaint, but some of them allow their friends the use of their signature to frank advertising circulars and pamphlets to a great extent. We have had frequent occasion to call attention to this flagrant abuse before.

If the abolishment of the franking privilege should be extended to the departments it would cost us thousands of dollars on what matter now passes free between us and the Patent Office. But we had rather pay the postage both ways, than have the Government deprived of the large revenue it now is, under the present franking system.

Let the various departments and all congressmen pay their own postage and each bureau charge the same to disbursement account, the same as if paid for stationary, clerk hire, fuel, etc. We hardly expect that our congressmen will pass any bill curtailing their own privileges, but that a reform is needed, no one knowing the abuse of the franking privilege can deny.

SUBMARINE DRILLING AND BLASTING--THE SHELBOURNE SUBMARINE DRILL.

The difficulties of navigating the East River entrance of New York harbor, especially by vessels of considerable draft, occasioned by natural obstructions, have been recognized ever since the settlement of Manhattan Island. About sixteen years ago the hight of the sunken rocks was considerably reduced by the Maillefert process, which consisted of lowering cans of gunpowder on the rock and exploding them by the galvanic battery and connecting wires, the theory being that the superincumbent mass of water formed a resistant or fulcrum against which the explosion might react. But where the rock presented a smooth surface without salient points this method has not proved satisfactory. In consequence the attention of engineers has been directed to the provision of some more adequate means.

The United States Government, having appropriated $85,000 toward the improvement of New York harbor, and General Newton, United States Engineer, having advertised for proposals, the contract for the removal of the Hell Gate obstructions has been awarded to Sidney F. Shelbourne, of New York who, on the 16th of December last, gave an exhibition of his machine, its powers being exerted on blocks of the hard Quincy granite. The principal part of Mr. Shelbourne's machine is a cast iron casing, in form a depressed semi-spheroid, or shallow inverted bowl, seven feet in diameter. It has three solid steel feet or toes by which its stability on the rock is secured. Rising from the upper part of the casting is a conical wrought iron frome, supporting the upper end of the drill shaft by means of two parallel rods entering into sockets in a cast ring at the top of the frame. The drill bar passing up through the centre of the top is furnished at the bottom with a bit, one and a half inches diameter, and having imbedded in its face nineteen diamonds, and rotating at the rate of from 300 to 500 revolutions per minute, advancing at the rate of from one to one and a half inches in the same time.

The feed is caused by a differential gearing which steadily operates to advance the drill into the rock, the debris being washed away by the water forced into contact with the bit through a small rubber hose. The water-tight chamber of the machine contains a pair of engines working at right angles to each other, with a horizontal stroke. As soon as the hole is completely drilled, and also when the drill-shaft is withdrawn from the rock, information of this is given by a magnetic bell which is acted upon by a double wire cord insulated from the water and passing down one of the parallel rods or tubs upon which the crosshead is fixed.

This drill weighs nearly five tons. It will be worked from a wrecking tug with a derrick by means of steam supplied from the boiler of the tug. To prevent this steam being condensed in its passage through the water to the engine it is conveyed in a hose surrounded by another through which the exhausted steam passes.

The rock which will be drilled in the Hell Gate is that known as the bastard granite, and is much softer than either the Quincy or Maine granite, on which the drill has been satisfactorily tested. After a number of holes are drilled over a certain space, a diver will descend and charge them with cartridges of nitro-glycerin, which will be exploded in the usual manner. In connection with the drill another very ingenious and automatic machine will be used to grapple and raise the fragments.

CONCEPTIONS OF THE INFINITE.

Try all we may, we fail to get even the most dim conception of the absolutely infinite—that which has no bound, no measure of comparison. We will cease to make any effort to conceive it as soon as we realize the fact that all our ideas are comparative. Size, color, form, weight, all the qualities in which material things differ from each other, are all judged by comparison with something else. A unit of comparison which answers well as a measure of some object or distance, may be found to be inadequate for the measure of a larger object or distance. To estimate the distances of very remote objects, as the fixed stars, it becomes necessary to take a very large unit of comparison, say the distance light travels in a single second.

Thus it has been estimated that Sirius the "dogstar" is at such a distance from the earth that light requires fourteen years to travel from it to our earth. When we reflect that light travels at the rate of 190,000 miles in a second, we can form a conception of this distance which would be impossible if we made a mile the unit of measurement. But this distance, large as it is, is rapidly increasing. It has been recently computed that Sirius is moving away from the earth at the rate of 144,000 miles per hour. The method by which this motion has been determined leaves no room for doubt as to its reality although it may well be doubted that the rate of recession is anything more than a rough approximation.

These illustrations, although they do not disprove the statement that the human mind cannot conceive infinity, show that the nearest approach to such a conception is in the study of that sublime science, astronomy. No wonder that the devotees of astronomy are the most laborious of all the divisions of the grand army of science. No wonder that they who nightly gaze upon the mightiest of God's works, should have ever been the most unwilling to doubt the existence of a higher creative intelligence. No wonder that this grand study has attracted to itself and appropriated the best talent of every age, and that those who "nightly assault the heavens with the artillery of science," are humbled with the sense of their own weakness as they contemplate the stupendous machinery of the universe.

WHAT IS SCIENCE ?

The primary signification of the word science is knowledge; but as generally accepted it means knowledge reduced to a system. All knowledge is comprised of facts and logical inferences from facts. The basis of all science then is fact, and the prime object to which all scientific research should be directed is the determination of facts. Facts, being the foundation upon which the logical superstructure must be reared, are of the most vital importance. They may not be assumed ; all guesswork is to be strictly shunned.

People are too apt to forget that it is quite possible to reason correctly and ably upon totally false premises. The world is full of books that exemplify our proposition. Old libraries are filled with quaint and labored expositions of almost every subject upon which men can think, valueless now, because they have been found to conflict with facts. It is with feelings of admiration that we roam through a collection of these almost forgotten labors—admiration for the talents which in the light of the nineteenth century, would have made a brilliant display, and which, even in the darkness of medieval times, made a manly and brave struggle to reach truth.

We pride ourselves upon the progress of the times, and we have good reason to do so ; at the same time it is not by any means improbable, that many of our views upon subjects relating to the sciences will be discovered to be fallacious by a future generation, as those of a past age have been by us. It seems to us that there is too much inquiry as to *why* things are and too little as to *how* they are. What is of practical value is how things occur—what are the invariable laws that govern their occurrence. Had Newton set himself to speculating as to why gravitation takes place, rather than to the investigation of the laws which govern the attraction of masses to each other, his labors upon that subject would have been altogether vain and worthless. But his was a mind that applied itself to the investigation of facts. It is true he hazarded some hypotheses, but they were only entertained by him as being what might ultimately be demonstrated by experiment to be true, not made the basis of system. The world has had too much theorizing and is now getting down to the true foundation, the veritable hardpan of all science facts.

REMINISCENCES OF TRAVEL IN SPAIN.

NO. III.

DUCAL PALACES—THE ESCORIAL OF PHILIP THE SECOND.

The public buildings of Madrid are unusually good, and there are many grand ducal palaces fitted and furnished in sumptuous style, the most interesting of which are those of the celebrated Duke of Alva, and Cardinal Ximenes, the latter in some respects the ablest man which Spain has ever produced. Ximenes began his career by entering a Franciscan monastery. During the reign of Ferdinand and Isabella, over whom he exercised a strong influence, his mind more than any other, controlled the policy of the kingdom, and to this day his memory is revered as a saint. The gloomy old palace is a fitting reflex of the rigorous habits of the Cardinal. The palace of the Duke of Medina Celi, facing the Prado, covers an area of 245,000 square feet, and is fitted up with all that taste, skill, and love of display which characterize the wealthy classes of Spain. The Marquis of Salamanca has two elegant palaces ; and until recently his picture gallery was looked upon as containing one of the finest private collections in Europe. Some of our readers will remember the Marquis as having been an active promoter of the Atlantic and Great Western Railway ; and the town of Salamanca, Pa., was named after him. It is reported that he lost heavily by his railway schemes, and that in order to repair the drain made upon his fortunes, he had sold at the recent Paris exhibition many of his valuable pictures, from which he realized upwards of three hundred thousand dollars.

Wealth in Spain, as in most monarchical countries, is very unequally distributed. The grandees are usually very rich in landed estates and other property, while the poor are very poor. In point of squalid poverty, the streets of Madrid are full of picturesque effects. Vice and immorality run through all classes of society, and yield their bitter fruits. The more common outward vice of the lower classes consists in their passion for bull-fights, cock-fights, and lotteries. It is a common thing to witness upon the streets, old men, women, and young children hawking about lottery tickets, from the sale of which they gain a miserable pittance.

Spanish history abounds in great mysterious characters, and we are obliged to confess that there was something strangely fascinating connected with our trip through that romantic country, which we can only explain by the fact that in early life we had read with interest "Don Quixote," Prescott's histories of "Ferdinand and Isabella," "Charles the Fifth," and "Philip the Second ;" also Irving's "Conquest of Grenada" and the "Tales of the Alhambra." The reader can therefore readily imagine with what eagerness we sought out the Audiencia where Ferdinand and Isabella were married ; the old palace where Philip the Second was born ; the little chapel at Seville, where Columbus met Isabella on his return from San Salvador ; the house where he died, and the parochial church where his funeral obsequies were celebrated, also the many exquisite edifices left by the exiled Moors. Perhaps, however, there is no single pile of architecture remaining in Spain so interesting as the Escorial—about two hours' ride by railway from Madrid, and regarded by the Spaniards as the eighth marvel of the world. The Escorial was designed and built by Philip the Second, a cold, haughty, intellectual bigot, who, after burying one youthful queen, went over to England and married "Bloody Mary." Philip does not appear to have been greatly afflicted when Mary died, for history represents him so very anxious to obtain another queen that he could scarcely wait for the six months' official mourning to cease before he sent his ambassador to claim the hand of Elizabeth of Valois, daughter of Catherine de Medicis, then in her sixteenth year, and knowing all the while that his unfortunate son, Don Carlos, had a strong passion for the beautiful princess.

History says that Philip was induced to found the Escorial as an act of gratitude to God, and especially to his patron, St. Lawrence, who inspired the victory of St. Quintin, in 1557. The buildings, which comprise a palace, temple, and monastery, cover 500,000 feet, and cost upwards of four millions of dollars in those times, when it is said that the laborers received but six cents per day for their work. The situation of the Escorial, under the shadow of the Guadarama mountains, is desolate and melancholy in the extreme. The mountains are one mass of bare gray granite, and the wide sweep of country lying in front is a monotony of rocks and stunted trees. Philip was two years in hunting out this situation, and if he had searched for two years more he could scarcely have made a selection more desolate. St. Lawrence suffered martyrdom by being roasted upon a gridiron, and it is thought that Philip had the form of that instrument in his head when he drew the plan, which no doubt was supplemented by a granite boulder in his hat, if one may judge from the immense piles of stone blocks employed in its construction.

The architecture of the Escorial is severely simple, grand and gloomy. Philip built it not for a prince, but for a monk, and wanted for himself only a cell, where he could live and die, in the palace he had built to God ; and certainly, we never before saw so much simplicity and solidity in any other similar structure. The palace was originally very plainly fitted up. Philip's cheerless cell, where he was accustomed to pass a good deal of his time, had four common-looking pictures hung upon the walls, a plain board table, a single chair, and a stool upon which he used to rest his gouty foot, the sacking still showing the stains from the remedies employed to kill the pain. These relics of the monarch are reverently shown, and attest the rigid austerities practiced by him after his retirement to the Escorial.

The treasures of the Escorial are very numerous. There are many fine paintings, statues, and tapestries, curious pieces of furniture, elegant and costly church vestments, beside several thousand saintly relics, highly venerated, among which are ten complete skeletons, more than a hundred heads, and several hundred bones. Philip had a passion for these things.

Just back of the choir of the temple, there is suspended a marble crucifix of life size, done by that famous man Benvenuto Cellini of Florence. He worked upon it, he says, "with the diligence, and love, that so precious an object deserves, and because I know myself to be the first who ever executed crucifixes in marble."

The library is a splendid room two hundred feet in length, and contains many rare and beautiful books, among which is a splendid Old Testament of the eleventh century in letters of gold with exquisite paintings ; also, a tastefully decorated copy of the Koran which is very old. We asked the custodian, what value was put upon the Old Testament, and he replied that a million dollars would not buy it. The fine, sharp portrait of Philip, which hangs in this library, represents a a pale, bloodless, careworn man of seventy-two, about to bid adieu to all his grandeur and renown. Such a picture, in such a place, makes it one of the most interesting portraits in existence.

The Monastery was shut to our observation, but we heard the solemn chanting of a few monks who are permitted to occupy its cells and cloisters. Upwards of seventeen hundred mass services are required to be performed every year in the Escorial, and following the custom of her predecessors, the late Queen, when she visited the place, was in the habit of hearing midnight mass at the altar of the pantheon under the temple.

The palace "is tenantless of its heroic dwellers," the courts are deserted, and the mind of the visitor is oppressed by the gloom which hangs heavily over a venerable pile that illustrates better than books, the character of the man who built it.

The palace is now very elegantly furnished—four of the the apartments, afterward fitted up by a subsequent king, in marquetry, with gold and steel door and window trimmings, cost upward of one million dollars. The temple is an enormous structure of massive granite, and beneath the high altar is a gorgeous pantheon fitted up as a burial place for the Spanish kings and queens. Philip died upon a couch within a small side chapel, through the window of which he could survey the splendid follies which he had created ; and his worn-out body was carried down and deposited within a recess of the pantheon. Twenty-one years were employed in the construction of the Escorial, and Philip was accustomed to ride from Madrid on horseback to superintend the work, perching himself on an elevation where he could overlook the situation and development of his costly gridiron.

We spent five hours' hard work in wandering about the vast buildings of the Escorial.

American Institute Lectures.

Dec. 30.—Mr. James Hall, State Geologist, Albany ; "On the Evolution of the North American Continent."

Jan. 6, 1869.—Prof. Horsford, Cambridge, Mass. ; "On the Philosophy of the Oven."

Jan. 13.—Dr. T. Sterry Hunt, Montreal, Canada ; "On Primeval Chemistry."

Jan. 22.—Prof. Doremus, College of the City of New York ; "On the Photometer."

Jan. 27.—Mr. Waterhouse Hawkins, of London ; "On Comparative Zoology."

Feb. 3.—Prof. Cooke, Harvard College, Mass. ; "On the Spectroscope."

Feb. 10.—Wm. J. McAlpine, Pres. Am. Soc. of C. E. ; "On Modern Engineering."

The Late King of Siam.

The name of the late King of Siam was Phra-Bard Somdetch-Phra-Pharamendr-Maha-Monkut. He was seventy years of age, and had some taste for civilization, having dug canals, built forts, railways, steamboats, founded a printing office at Bangkok, and paid some attention to education. These peculiarities probably came from reading the *Evening Post*, to which he was for many years a subscriber.

The king leaves an extensive family of widows, said to be two thousand in number, to mourn his loss. He spent the last years of his life chiefly in studying Siamese theology, and in photographing his wives.

We have a very high respect for the *Evening Post*, and it is therefore with some hesitation that we disturb its theory respecting the progress made in civilization by Phra-Bard Monkut, of Siam. His late highness was a regular reader of the SCIENTIFIC AMERICAN, and it seems to us very likely that he learned more from its columns about forts, steamboats, railways, canals, and photography, than from the *Post*; but so far as his knowledge of theology and social science is concerned, we have no doubt that he found the *Post* an able assistant, and we hope our cotemporary will forward a copy of the paper containing the notice to each of the two thousand bereaved widows.

Sensations in a Balloon.

The question "Are you not dizzy in looking down from a balloon?" was answered awhile since by the Boston *Journal* as follows: "Dizziness or giddiness is something entirely unknown in æronautic traveling, and therein is one of the most surprising facts of ballooning. You look downward with the same steadiness and composure with which you look off from a mountain top. Another strange feature is that the balloon seems to stand perfectly still. Common sense teaches you that you are moving when the distance between you and certain objects is widening, but there is no other indication of the fact, nor is there in rising and falling in the atmosphere. Immersed in the air current, and traveling at the same or nearly the same velocity, the balloon seems relatively becalmed.

This fact, the *Journal* goes on to say, sufficiently explains the utter uselessness of sails and rudder. There is no wind to fill the one, nor fulcrum or resisting force for the other. The only power of a gas balloon is its buoyant force, and thus all inward efforts at propulsion or control, beyond a simple means of rising or falling through a depreciation of the buoyant material or the ballast weight, are manifestly fruitless. Until some other inward motive power than mere buoyancy is devised, no forward step can be made in ærostatics, and the union of any other with the gas balloon is entirely hopeless, since the craft is wholly at the mercy of the element which sustains it. The wind currents, too, are so variable that navigating the air between given points under their control would be quite as much out of the question.

No difficulty is experienced at a less hight than two or three miles, by persons in health, nor is any other decided sensation felt under ordinary circumstances. There may a slight ringing or closing of the ears with some persons in a less altitude, but in the upper regions a deafness is experienced. At the hight of three and a half miles the atmosphere is known to have just half the density it has at the surface, and there is, of course, the corresponding decrease of atmospheric pressure. At the surface, a man of ordinary size is said to sustain an atmospheric pressure of 25,000 pounds, while at the hight named it is reduced one half, the change bringing with it many discomfits. The reduction of atmospheric pressure is felt by the balloon through the expansion of the gas and the distention of its envelope, and thus to rise to great altitude necessitates an expenditure of the gas, as well as of ballast. To guard against a too sudden expansion of the balloon, the open neck at the bottom serves as a sort of safety valve, while it also becomes necessary to let out gas at times through the valve at the top.

Exploration of Central Asia.

At the last meeting of the Royal Geographical Society, London, Sir Roderick Murchison said the attention of the society had been strongly drawn of late toward Central Asia, and particularly to the vast regions which bordered the north-eastern and northwestern frontiers of British India. The principal region in the northeast embraced the country lying between Assam and Szechuen, the most westerly province of China. A warm desire was expressed by a committee of the British Association, as well as by the Council of the Geographical Society, that that intervening space of about two hundred and fifty miles only should be explored, in order to ascertain if there be practicable passes through the high mountains and wild tracts which separated the upper waters of the Yangtse-kiang from the Brahmaputra at its great bend near Sudiya. Although as yet no positive effort has been made to solve the important problem, the Indian authorities are making efforts to open a route of traffic along a more southerly line between British Burmah and the great Chinese province of Yunnan, now essentially independent of Chinese rule, and most desirous of establishing a trade with our settlements on the Irawaddy.

Of still more pressing importance, however, than an acquaintance with the regions alluded to, is an exploration of the vast and unexamined tracts on the northwest, far beyond the tributaries of the Upper Indus, or between Peshawur and Jellalabad on the south, and the centers of trade and population at Yarkand and Kashgar. The main object is to define the physical character of the vast elevated plateau called Pamir, or "Roof of the world," from which the Oxus and Zarafshan take their rise, and from which the lofty chains, the Kuen Lun, the Himalaya and Hindoo Koosh radiate. In 1867, Sir Roderick urged the essential importance of such knowledge, to be acquired equally by the Russian and British governments; and he then said that this great table-land or watershed ought to be constituted the neutral ground between the two empires, and to be considered as a broad zone to be forever interposed between eastern Turkestan—toward which Russia has now advanced—and the most northern limits of our Indian possessions.

With a view to taking a first step in this desirable exploration, the Council of the Geographical Society sent out last spring a practiced traveler, Lieutenant Hayward, to traverse this region from Peshawur.

Wooden Railways.

The feasibility of laying wooden railways in districts where the traffic does not require a high rate of speed, and where there is an abundance of hard and durable timber, has been recently made the subject of discussion by our Canada exchanges, and by letter we are informed that the method is proposed for Australia, a kind of timber being found there which is very hard and particularly adapted to the purpose. A. M. F. P. Mackelcan, in a communication to the Perth *Expositor*, gives a favorable opinion as to their utility based upon practical experience.

The cost of such railways being so much less per mile than those of iron, the shortening of distances by deep cutting or filling is obviated. The natural features of the district through which it passes can be complied with. The low rate of speed renders the erecting of very expensive bridges unnecessary, and as light locomotives only are proposed, the wooden rails are sufficiently strong for perfect safety.

In many parts of Canada, movements looking toward the construction of such roads are on foot, and an exchange informs us "that $96,000 have been voted by different interested townships in aid of the Toronto, Grey, and Bruce Railway, and the Toronto City Council has passed a by-law granted $250,000 for the same purpose. These sums, it must be borne in mind, are bonuses in aid of the road."

The *Kingston News* says that among the notices of application to Parliament appearing in the *Official Gazette*, is one relating to a wooden railway from Kingston to Loughborough and adjoining townships. "The projected railway is destined to be realized as a fact, and will prove the adaptability to the wants of the back townships of Canada. The people of Kingston are of course very much interested in the success of an enterprise so well calculated to improve the fortunes of the city, and we feel sure they will do all in their power to promote the passage of the company's charter, and to otherwise aid them in the important work." In many other places these railways are talked about. In his communication above referred to Mr. Mackelcan says:

"I would like to caution those who may patronize or push forward this new system, against making things too great and too grand, under plea of suiting the future, for in this way the present and the future are both destroyed. That which will help Canada to grow into a thickly peopled, well cultivated, and prosperous country, is a net work of cheap conveyance, created in the country by its own industry and with its own capital, and costing so little as to pay for itself in a few years."

The estimated cost of such roads is from $4,000 to $5,000 per mile, which seems to us to be ample. We are inclined to think much more favorably of these practical ideas than the visionary project of a British American Inter-oceanic Railway, alluded to by us in a former number. We hope the plan may be well tested, and feel quite confident it will ultimately succeed.

GEOGRAPHICAL AND ARCHEOLOGICAL.

Putnam's Monthly, for January, says:

Captain Burton (the discoveror of Lake Tanganyika) has a new book of travels in the press, under the title of "Explorations of the Highlands of Brazil," with a full account of the gold and diamond mines. Also, of canoeing down 1,500 miles of the great river San Francisco, from Sabara to the sea.

THE first complete census of the Cape Colony, South Africa, was taken in March, 1865. The enumeration, which does not include Natal and the Transvaal Republic, shows a total of 181,592 persons of European birth or descent, and 314,789 natives, the latter consisting principally of Hottentots, Kaffirs, and Bushmen. From a partial census, made in the year 1855, it appears that an increase in ten years was at the rate of 86 per cent. Unlike other colonies composed of mixed races, the rate of increase was much greater among the native tribes than in the white population. Among the possessions of the colony are 226,000 horses, 250,000 draft oxen, 10,000,000 sheep, and 2,440,000 goats. In the list of productions we find 1,390,000 bushels of wheat, 1,633,000 pounds of tobacco, and 3,237,000 gallons of wine. 75,000 persons are employed in agriculture and 13,000 in manufactures. Two-thirds of the white population and one twentieth of the natives are able to read and write. Including Natal and the Transvaal Republic, thirty-two newspapers are published—ten in the Dutch and twenty-two in the English language.

LIEUTENANT WARREN is continuing his excavations at Jerusalem with equal zeal and labor. He has discovered that the foundation wall of the platform of Mount Moriah, upon which stands the Mosque of Omar, as once stood the Temple of Solomon, was originally 1,000 feet long, and 150 feet high, nearly the length and hight of the Crystal Palace at Sydenham. He traced the enormous masses of stone, which are still visible at the southern end, to a depth of 45 feet below the present surface. Behind this wall there are the remains of vast tunnels, arches, and chambers, which Lieutenant Warren refers to the old Jewish Jerusalem, before the time of Herod.

THREE English gentleman, Messrs. Freshfield, Moore, and Tucker, last summer succeeded in ascending the Elburz, the highest peak of the Caucasus, the altitude of which they ascertained to be 18,526 feet. Since geographers have adopted the axis of the Caucasus, from the Black to the Caspian Seas, as the boundary line between Europe and Asia, and the peak of Elburz lies on the European side of this line, it thus becomes the highest mountain in Europe, exceeding Mont Blanc by more than 3,000 feet.

THE committee charged to collect funds for the French expedition to the North Pole, has published a report, stating that the vessels will be in readiness by the commencement of this year. It is intended to despatch the expedition from France in January, if possible, in order that it may reach Behring's Strait by the end of July.

PETERMANN'S "Mittheilungen" in Gotha publishes a map of Lower California, from the exploration made by J. Ross Browne, Gabb, and Loehr. An account of the journey, with interesting geological details, from the pen of Herr Gabb, is added.

Editorial Summary.

AGASSIZ'S EXPLORATIONS IN BRAZIL.—The geographer Petermann says of Agassiz's "Explorations in Brazil": "The history of scientific expeditions has scarcely an example which, in point of brilliancy and aid rendered from all quarters, can be compared to this journey of Agassiz. It is known that since his settlement in Cambridge, he has received such a recognition and support from the Americans, as a man of science has seldom enjoyed, and it now appears from his work on Brazil, that also in South America all classes of the people united to do him honor. Had Humboldt visited Brazil during the last years of his life, his reception could not have been more splendid."

A GOOD story is told of a merchant whose business is located on the eastern side of the Sierra Nevada. Being in want of additions to his stock he purchased goods in San Francisco and ordered them shipped *via* the Central Pacific Railroad to its terminus at the time the goods were shipped, supposing that by the time the goods were ready, the road would have progressed nearly to his location. Such progress was made in the interim, however, that the goods were delivered at a point fifteen miles on, from whence they were carted back to their destination.

TO REMOVE SUBSTANCES FROM THE EYE.—To remove foreign bodies from beneath the eyelid, take hold of the upper eyelid, near its angles, with the index finger and thumb of each hand. Draw it gently forward, and as low down as possible over the lower eyelid, and retain it in this position for about a minute, taking care to prevent the tears from flowing out. When, at the end of this time, you allow the eyelid to resume its place, a flood of tears washes out the foreign body, which will be found adhering to, or near to, the lower eyelid

SMOKE WREATHS.—We are in receipt of several communications in regard to smoke wreaths which we are obliged to pass by. The subject is of little or no practical importance. Such wreaths are caused by friction upon the external portion of a volume of smoke caused by its partial adhesion to the walls of the gun, tube, or aperture through which it is forced. This gives a rolling motion from the center of the volume outward and produces the phenomenon. With this explanation we dismiss the subject.

THE removal of Union College from Schnectady to Albany, N. Y., and making it in connection with the Albany Medical and Law schools, and the Albany Observatory, into a State University is strongly urged. It is asserted that if the citizens of Albany will raise $500,000, the trustees of the College will consent to the arrangement and transfer the entire college apparatus, cabinets, library, etc., and the college endowment, now estimated at one million five hundred thousand dollars.

WE understand that the splendid collection of engineering models, belonging to the late Professor Gillespie, of Union College, Schenectady, has passed by purchase into the possession of that institution. It is probably the finest collection of engineering models and instruments in the United States. The department of engineering is now under the direction of Prof. Staley, a former pupil and assistant of Prof. Gillespie, and a gentleman of singular ability in his profession.

BARON JAMES DE ROTHSCHILD, who died in Paris, November 15, left a fortune estimated by the French papers at $400,000,000. Most of this is in stocks, money, and portable securities; but he had also splendid town and country houses, the latter close to the Bois de Boulogne; and fifty-one other houses in Paris; palaces at Rome, Naples, Florence, and Turin; and more or less property in nearly every great city of Europe.

OLMSTED'S SELF OILER.—In the description accompanying the engraving of the oiling device in the last issue of the SCIENTIFIC AMERICAN, it is stated that it was patented Jan 21, 1868. That is the correct date of the oil cup patent, but the hollow shaft patent was issued as long ago as May 2, 1865.

AN eastern professor states that the meteoric showers of the last two years were occasioned by the tail of a comet which passed in 1866. He estimates the flow as being 200,000 miles per day, and that it has been nearly three years in passing. Truly this is a stupendous tale.

A NEW method of attaching the soles of boots and shoes to the uppers has been patented. Copper wire is used for stitching instead of the ordinary shoe thread. It is claimed that superior strength is gained by this method, with but a trifling increase in the cost of the work.

A KENTUCKIAN writes to the *Northwestern Farmer*, that of a lot of telegraph poles put up in Kentucky, the chestnut rotted first, the cedar gave way next, the locust stood five years longer and are still nearly sound.

A YOUNG writer having asked the Petersburg *Express*, which magazine would give him most speedily the highest position, was advised by the editor to contribute a fiery article to a a magazine of powder.

IT is stated that the Czar of Russia has sent two engineers to inspect the Pacific Railroad, with a view to utilizing whatever information they may obtain in the construction of a road from St. Petersburgh to Chinese Tartary.

A SINGLE establishment in Vermont turns out 100,000 slate pencils per day. How many little fingers and young brains they must keep busy.

Applications for Extensions.

The following is a list of pending applications for extensions filed prior to Dec. 1st. The date of the patent, and day of hearing of the application at the Patent Office, are annexed in each each:

Rebecca A. Marcher, executrix of R. I. Marcher, deceased; dated May 22, 1855; Tool for Grooving Moldings. Hearing, Dec. 21, 1868.

John C. Schooley; March 14, 1855; Process of Curing Meats. Dec. 28, 1868.

Birdsill Holly; Feb. 6, 1855; Elliptical Rotary Pumps. Jan. 11, 1869.

Warren Holden; May 1, 1855; Boot and Shoe Stretchers. April 5, 1869.

Geo. W. Hubbard and Wm. E. Conant; Jan. 9, 1855 reissued Sept. 18, 1866; Operating Slide Valves in Direct Action Engines. Dec. 21, 1868.

Jarvis Case; Jan. 16, 1855; reissued Nov. 16, 1858; again reissued April 17, 1866; Seed Planters. Dec. 21, 1868.

Arnton Smith; Jan. 16, 1855; Plow. Dec. 21, 1868.

Ambrose Foster, for himself and the representatives of J. A. Messenger, deceased; Jan. 16, 1855; Building Block. Dec. 21, 1868.

Newell A. Prince; Jan. 23, 1855; Fountain Pen. Dec. 28, 1868.

Russell Jennings; Jan. 30, 1855; reissued Oct. 3, 1865; again reissued Jan. 16, 1866; Auger. Jan. 11, 1869.

Jotham S. Conant; Jan. 16, 1855; Sewing Machine. Dec. 28, 1868.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

An excursion over the first twenty miles of the Lake Superior and Missisippi Railroad took place on the 21st of November, and an inspection by the St. Paul city common council. The inspection was made with the view of obtaining an appropriation of $150,000 from the city. The completion of the road is looked for in 1870.

The northern extension of the North Missouri Railroad now extends seven miles beyond the Iowa State line and is rapidly progressing.

A proposition to build a wooden railway along the Lake Superior range from Portage Lake to the Cliff mine has met with great favor. Several thousand dollars of stock were subscribed in a single day. The full amount required is $200,000.

A large furnace has just been erected in the newly developed iron regions of Roane county, four miles from Kimbrough's Landing, on the Tennessee river. From 150 to 200 men are employed.

The proposed hydrographic survey of Vermont, of which we took notice some time since, has been decided upon and the legislature of that State taken the necessary action.

The receipts of cotton at Shreveport, Louisiana, for the month of October reached 6,637 bales, against 500 bales for the corresponding month last year. The receipts since the 1st of September amounted to 12,962 against 1,210 for the same period of time last year.

We understand that the managers of the New York & New Haven, New Haven, Hartford & Springfield, and the Boston and Albany Railroads, have decided to run daily, after the opening of spring, a fast train between New York and Boston, making only four stoppages, viz., at New Haven, Hartford, Springfield, and Worcester. Time six hours and distance about 230 miles, an average of nearly 40 miles per hour including the four stoppages.

NEW PUBLICATIONS.

MAGAZINES FOR JANUARY.

The ECLECTIC is embellished with "Tasso reciting his Poem at the Court of Ferrara," and contains "The Phantoms of St. Mark's," "The Hindu View of the late Eclipse," "Madame de Lafayette," "The Sun's Distance," and other good articles. The ATLANTIC MONTHLY is brimfull of good things. The GALAXY ought to be read by everybody. The RADICAL has several fine articles. LIPPINCOTT'S MAGAZINE has a choice variety. [Baltimore comes into the field with the NEW ECLECTIC MAGAZINE, the selections for which exhibit great care; Turnbull & Murdock, publishers. GOLDEN HOURS, a monthly magazine for boys and girls, Hitchcock & Malden, Cincinnati; a capital serial, well illustrated.

THE CHEMICAL NEWS.

We are informed that the American publishers of this periodical propose to add to the English edition a Supplement, containing notices of the current progress of chemistry and the physical sciences in America. The new feature is inaugurated in the December issue, and will be under the editorial charge of Professor Charles A. Seely. This addition will greatly increase the value of this excellent periodical for American readers.

SLOAN'S ARCHITECTURAL REVIEW AND BUILDERS' JOURNAL.

We are in receipt of this magazine for October, November, and December. These numbers are beautifully illustrated with original designs of churches, dwellings, public buildings, and drawings of carpenters and joiners' work, with details and specifications. We most cordially commend this first class publication to all directly or indirectly connected with building, whether architects, contractors, or workmen. To lovers of art, it will prove a magazine of great interest and value, and is worth double its subscription price, $6, to the general reader. Published by Claxton, Remsen & Haffelfinger, 819 and 821 Market street, Philadelphia.

W. J. TAYLOR, of Berlin, N. Y., has a Wheeler & Wilson Sewing Machine (No. 289) that has done nearly $5,000 worth of stitching during the past sixteen years, and is now in perfect working order.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,393.—COOLING AND BARRING SOAP.—Silas Divine, New York city. Nov. 7, 1868.

3,433.—BREECH-LOADING FIRE-ARMS, AND CARTRIDGES FOR BREECH-LOADING AND OTHER FIRE-ARMS.—Gustav Bloem, Dusseldorf, Prussia, and Ernst Scheidt, New York city. Nov. 12, 1868.

3,465.—PROPELLING VESSELS.—A. C. Loud, San Francisco, Cal. Nov. 14, 1868.

3,472.—RAILWAY WHEEL.—Geo. G. Lobdell, Wilmington, Del. Nov. 14, 1868.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

SLED BRAKE.—James Willis, Mifflin, Wis.—The object of this invention is to provide a simple and efficient brake for sleds, and consists in an arrangement of levers and connecting rods to operate an oscillating shaft having lugs to take into the ground.

AXLES OF VEHICLES.—Edward Finn, Berlin, Wis.—The object of this invention is to provide the means of easily and quickly removing or putting on the nuts of axles, and at the same time enabling the same to be firmly held in place.

MILLSTONE DRESS.—Benjamin C. Stephens, Houston, Mo.—This invention relates to a new and improved millstone dress, whereby grain may be ground in a uniform and perfect manner.

CAR BRAKE.—D. J. Parmele, San Francisco, Cal.—This invention consists of an improved arrangement of mechanism for instantly throwing a pair of friction wheels, into gear, to the shaft of one of which the brake chain is attached, the other being arranged on the car axle.

PROPAGATING BOXES.—Albert D. Manchester, Westport, Mass.—This invention relates to improvements in boxes or crates for propagating purposes, the object of which is to provide boxes of cheap construction that will facilitate the same and afford a ready means for removing them from the boxes without injuring the roots.

HARROW.—B. T. Martin, Charlotte, Mich.—The nature of my invention relates to improvements in harrows, whereby it is designed to provide an arrangement which will admit of a better adaptation of the same to uneven ground, and whereby, also, it may be adjusted to a condition for leveling uneven ground.

INK CASTER AND CASE.—J. M. Kennedy, Vicksburg, Miss.—The object of this invention is to provide an article of desk and table furniture containing a number of useful things, all of which relate to clerical operations, that is to say, to the performance of uniting ruling, sealing, dating, and the like.

KNIFE AND SCISSORS SHARPENER AND CLEANER.—Wm. Miller, Chicopee, Mass.—This invention relates to a new device for sharpening and cleaning table and other knives, and also for sharpening scissors, and it consists in the knife-cleaning apparatus, which is composed of a series of vertical leather or other plates, which are arranged between a spring and a screw, so that they may be pressed together with suitable force.

TREATMENT OF WASTE LIQUOR PRODUCED IN THE MANUFACTURE OF GELATIN BY MURIATIC ACID.—Frederick Bihn and Wm. Schrader, Frankford, Pa.—The object of this invention is to separate the ingredients of the waste liquor which is produced in those glue factories in which gelatin is made by treating certain bones with diluted muriatic acid; and the process consists in separating the ingredients by the evaporation and subsequent condensation of the muriatic acid, whereby the phosphate of lime remains as a residuum. The invention also consists in treating the waste liquor with sulphuric acid, for the purpose of aiding and facilitating the aforesaid evaporating process.

CAR COUPLING.—W. G. Bell, Pittsburgh, Pa.—The object of this invention is to provide a simple and effective car coupling, by the employment of a double-headed connecting bolt, pointed at the ends, and arranged to enter the bell-mouthed buffers and separate a pair of spring-actuated clamping jaws, so that the heads will pass beyond the said clamping jaws which close behind the said heads and establish the connection of the cars automatically. The said jaws are adapted to be opened behind when the cars are to be uncoupled.

OPERATING HEAD BLOCKS IN SAW MILLS.—John F. Cook, Baltimore, Md.—This invention consists in an arrangement of parts whereby either head block may be moved into any desired position on the carriage with comparative ease by one man; also, in a novel mechanism for producing either a simultaneous or independent movement of the knees, as may be desired; also, in a graduated device for regulating the movement of the knees.

GATE LATCH.—Benjamin Hendrickson, Huntington, N. Y.—The object of this invention is to provide a means by which farm and other gates may be sustained partially upon the latch post while the gate is closed, and also operated more easily in closing and opening the same.

PLOW.—J. L. Stearns, Mahomet, Ill.—The object of this invention is chiefly to provide a riding or sulky plow, so-called, which is adaptable as a gang breaking plow, or a subsoil plow, by merely changing the plows, that is to say, by attaching the proper plows to the sulky.

PLOWING HOE.—Thomas J. Mason, Harmony, Maine.—This invention has for its object to furnish an improved plowing hoe, simple in construction, strong, durable, not liable to get out of order, easily repaired, and which will do its work well and thoroughly, requiring no plow or cultivator to be previously used.

DRESSING GLASS REFLECTORS.—Charles Furber, London, England.—This invention relates to improvements in dressing glass reflectors, whereby it is designed to provide an arrangement of the same that will facilitate the inspection of the back part of the head, or other portion of the body while dressing.

SUSPENDING SCISSORS.—J. H. Kuttner, Hempstead, Texas.—This invention relates to an improvement in the method of suspending scissors in dry goods stores, and in other situations, whereby they are rendered more useful by being made more available than they have hitherto been.

TOOL FOR CUTTING MOLDINGS.—D. W. Perry, Wilkesbarre, Pa.—This invention relates to planing machines for cutting moldings, and it consists in the manner in which the bit or cutter is formed, and in the manner of its attachment to the head, whereby many objections to the common method are obviated, and many advantages secured.

SIGNAL LANTERN.—John Graham, Grafton, W. Va.—The object of this invention is to provide a simple, cheap, and convenient signal lamp for railroad use.

TOY PISTOL.—Thomas E. Marable, Petersburg, Va.—This invention relates to that class of toy guns and pistols, in which the projectile is forced from the barrel by means of an elastic cord, and it consists in providing an adjustable stop which will prevent the ball from accidentally falling out of the barrel, although not interfering with the operation of the toy when the cord, having been drawn back over the notch, is disengaged therefrom by the trigger.

CULTIVATOR.—Clark Alvord, Westford, Wis.—This invention comprises four separate improvements in cultivators, namely: 1st, a new method of attaching the teeth; 2d, a new device for holding them in the ground; 3d, an improved apparatus for cleaning them; and, lastly, a novel construction of the frame, draft pole, and cleaning apparatus, for the purpose of enabling the teeth to be raised or lowered conveniently, and of fixing them in contact with the ground or at any required elevation above it.

CLOTHES LINE FRAME.—William H. Acker, Tarrytown, N. Y.—This invention relates to a new and improved frame for the purpose of fastening clothes lines thereto, so that they may be drawn to a proper state of tension when clothes lines are adjusted upon them.

SANITARY BRACE.—F. Pinckard, New Orleans, La.—The object of this invention is to force persons to keep their mouths closed, and to breathe through their noses during sleep.

CORN PLANTER.—John D. Chambers, Carthage, Mo.—This invention consists of an improved arrangement to permit the plows to follow the inequalities of the ground, and to be raised out of the ground, when moving to or from the field; also, certain improvements in the plows, the dropping apparatus, and the framing, designed to provide an efficient machine of cheap construction.

BEDSTEAD FASTENING.—William Johnston, Appleton, Wis.—This invention has for its object to furnish an improved bedstead fastening, strong, durable, simple in construction, not liable to get out of order, and which may be easily attached and detached.

HYDROCARBON BURNER.—Louis Verstraet, Paris, France.—This invention relates to improvements in the use of petroleum or other mineral oils for fuel for generating steam in steam boilers, and for other purposes. It consists in the peculiar construction and arrangement of furnaces and discharge tubes and oil reservoirs, in the use of air which has been saturated with the vapor of petroleum in the reservoir, in combination with the petroleum in the process of combustion, and in supplying the boiler in part with the water condensed from the vapors evolved in the process of combustion on their passage through the smoke flues of the boiler.

DRESSER COPPER.—W. H. Boyden, Rockland, R. I.—The object of this invention is to construct a dresser copper for dressing cotton warp, in such a manner that the edges of the copper with which the threads come in contact can be finished smoother than heretofore, and when in use will wear away more slowly; and so that when the parts of the metal in contact with the threads become worn to any extent, so as to endanger the threads, they can, without cutting the threads, and reaming out the copper, be adjusted in a few minutes so as to bring a new surface of metal in contact with the threads; thereby saving a great deal of time and labor and rendering the instrument much more convenient to operate that heretofore.

CONUCTORS' PUNCH.—J. and G. D. Friese, Baltimore, Md.—The object of this invention is to so improve the common instrument for cutting eyelets in paper, leather, cloth, etc., that the spring that forces the jaws apart will not wear out or get out of order so soon, while the piece punched out of the paper, leather, etc., will be more certainly and effectually removed from the tooth or cutter.

HARROW.—O. W. Edmonds, Bluffdale, Ill.—This invention consists in connecting two rotating harrows to a supporting beam or frame by adjustable connections, whereby they may be changed in reference to the distance from each other, and in providing a spring or springs in connection with the shafts of the harrows and the supporting frame, whereby the inclination of the harrows with reference to the surface of the ground may be governed, as also the duration of their rotation.

SHUTTER AND BLIND FASTENING.—W. B. Farrar, Greensboro, N. C.—This device relates to that class of locks or fastenings which are applied inside of a building to secure the bolt by which the shutter bar is confined; and it consists in a lock so constructed and operating that such bolt cannot be removed by a person outside of the building, while it can be fastened at any time from the outside without the necessity of going within.

PREPARING COD FISH.—Elisha Crowell, New York city.—The object of this invention is to so prepare cod or other fish that it shall be divested of everything not edible, which unnecessarily adds to its weight and bulk, and shall be reduced to the most convenient form for handling and transportation, while at the same time it is sufficiently protected from the action of the air.

COAL CHUTE.—H. Merriman, Bloomington, Ill.—This invention relates to a new and useful improvement in coal chutes used for loading and discharging coal into boats, cars, or vehicles of any kind, whereby the operation of discharging coal is greatly facilitated.

HORSESHOE.—Robert G. Jameson and Wm. H. Chamberlain, Bristol, N.H.—This invention relates to a new and improved method of constructing horseshoes, whereby they are rendered much more useful than horseshoes made in the ordinary manner, and it consists in forming a curved bar with the calks formed on it, and attaching it to the shoe.

COMPRESSION COCK.—G. E. Boissilier, St. Louis, Mo.—This invention relates to improvements in cocks for discharging liquids or fluids, and it consists in operating a socket valve within the shell of the cock by revolving the stem.

MACHINE FOR QUARTERING APPLES.—Clark E. Billings, Warren, Vt.—This invention relates to an improved machine for quartering apples in the process of preparing them for drying, cooking, or other purposes, and the invention consists in pressing the apple into horizontal knives by a plunger operated by a spring lever.

BRIDLE.—John McKibben, Lima, Ohio.—This invention relates to a new and improved bridle, difficult to explain without an engraving.

SEWING MACHINE ATTACHMENT.—James Wensley, New Brunswick, N. J.—The object of this invention is to provide an improved adjustable guide for sewing machines, and also an improved adjustable presser.

METHOD OF IMPRINTING THE GRAIN OF WOOD ON PAPER OR OTHER SUBSTANCES.—Johann Bongardt, New York city.—This invention relates to a new process for producing on paper or other material a beautiful imitation of the various grained woods, and it consists in so treating the planed surface of a piece of grained wood that it can itself be used as a block for copying its grain with great accuracy upon the paper. In this manner the most exquisite imitation wood paper hangings, and even imitation veneers, can be produced at a trifling expense.

MACHINE FOR FORGING AND SHAPING RIVETS, SCREW BLANKS, ETC.—Francis Watkins, Birmingham, England.—This invention relates to a new machine for heading rivets, screw blanks, and other bars, when the same are prepared in pieces of the required length. The machine is so made that two sets of heading devices are in constant operation, a head being formed alternately on each machine, so that the power required for one machine is utilized to operate two. The invention consists chiefly in the use of two rotating disks, mounted at the ends of a shaft, on which shaft is also placed and keyed a ratchet or feed wheel, worked by a hooked rod which is pinjointed to a lever acted on by a cam on another shaft. In the periphery of each of the disks or the carriers are placed dies for receiving the shanks or necks of the rivets, bolts, screw blanks, or other articles to be headed. Inside of these dies are "tippers" or sliding bolts for holding the blanks to their work, and for discharging the same when finished. These tippers per form their work by means of their inner ends being cranked and resting in the grooves of a stationary cam, one such cam being arranged within each rotating disk. The tippers are made of two pieces screwed together, so that they may be adapted to hold blanks of various lengths to the header The two sides of the machine are alike, but the dies in the disks are arranged so that blanks are headed alternately on one and on the other side.

FLUTING MACHINE.—Wm. D. Corrister New York city.—This invention relates to a new fluting machine in which the upper one of a pair of hollow corrugated rollers is hung in an up-and-down adjustable frame, which can be set by means of a vertical screw, while the required degree of pressure is produced by means of a spring coiled around the screw.

APPARATUS FOR UNLOADING AND STACKING HAY.—W. D. Brooks, Bethany, Pa.—This invention consists chiefly in a novel manner of operating the truck from which the fork or load is suspended, said truck running on a flexible track, which is fastened at one end, and which works around a swiveled pulley that is higher than the fastened end of the track, so that the latter is thereby lower at the fastened end, and causes the truck to move automatically toward the same. But when it is desired to make the truck move toward the pulley, the flexible track is slackened, and a cord fastened to the truck is pulled, so as to cause the track to be higher at the fastened end.

MACHINE FOR PUNCHING AND SHAPING SCREW NUTS, ETC.—Francis Watkins, Birmingham, England.—This invention consists chiefly in operating both the cutting as well as the punching tools of two machines from one single shaft. On the main shaft of the machine is a driving wheel, which gears into a spur wheel and thereby drives another shaft, on which are keyed two cams, actuating two slides which carry compound punches; the solid punches carried by one slide working within the ring punches carried by the other. The machine is double acting, and there are similar tools at each end of each slide. The slide which carries the ring punches actuates two other slides, opposite its two ends, by means of rods fixed to the first slides and passing through the others. The rods have adjustable nuts upon them and allow a certain amount of independent motion in the end slides which also carry ring punches similar to those carried by the slide which actuates them. Dies or forming boxes in which the articles to be made are formed, are secured to the frame of the machine by means of bolts or otherwise.

REFRIGERATORS.—S. Wheat, Middletown, N. Y., and D. B. Wheat, New York city.—This invention has for its object to furnish an improved refrigerator which shall be simple in construction and effective in operation, preserving the provisions or other substances placed in it for a longer time, and with a less supply of ice than is possible when the refrigerator is constructed in the ordinary manner.

COMBINED BAND CUTTER AND FEEDER.—P. G. Biggs, H. Granger, H. A. Butler, Macon city, Mo.—This invention has for its object to furnish an improved machine by means of which the bands of the bundles or sheaves of grain may be cut and fed automatically to the threshing machine with a spreading movement, so as to enter the said threshing machine in proper position for being threshed.

SEED PLANTER.—Isaac Rexford, Malone, N. Y.—This invention has for its object to furnish an improved seed planter, simple in construction, effective and convenient in operation, doing its work accurately and well, and which may be easily adjusted to plant various kinds of seed.

BRIDLE BITS.—William S. Robbins, New Bedford, Mass.—The object of this invention is to provide a bit for a horse bridle, in such a manner as to form a safety bit at all times in addition to an ordinary bit.

AUTOMATIC STOP FOR MINING CARS.—James Tamblyn, Virginia city, Nevada.—The object of this invention is to a simple automatic stop to prevent mining cars from running into the shaft before the "cage" is up at the mouth or top of the shaft to receive the car.

SPADE.—Michael Connolly, Newark, N. J.—This invention relates to a new and improved spade, and it consists in a peculiar construction of the same, whereby the earth may be dug considerably deeper than with an ordinary spade, and with less labor.

SCOOP.—Thomas B. Davis, New York city.—This invention relates to a new and improved mode of constructing sheet-metal scoops in one piece of metal, whereby they may be manufactured at a less cost and in a superior manner to those ordinarily made.

HARVESTERS.—Mason Gibbs, Homer, Mich.—This invention relates to a new and useful combination of a reel and rake for harvesters.

PLOWSHARE.—George W. Cooper, Ogeechee, Ga.—This invention relates to a new mode of constructing plowshares, and also to a new manner of s curing the same to the foot. The plowshare is made of cast iron, and by its peculiar shape and construction, it can be made without a land side plate. The fastening device is a U-shaped bolt, passing with one arm through the share and foot, and with the other arm through the share into the foot, so that by means of one bolt and nut, the effect of two bolts and nuts, without their disadvantages, is produced.

CLOTHES BOILER.—Daniel Kellogg, Ypsilanti, Mich.—The nature of this invention relates to the cleansing of clothes by circulating boiling water through them.

HORSE BRUSHES.—W. W. McKay, Ossian, Iowa.—This invention relates to improvements in horse brushes, whereby it is designed to provide a rotating brush, to which motion may be readily communicated by hand, and so arranged as to admit of the substitution of one brush or comb for another readily.

PRESERVING WOOD.—Nicholas C. Szerelmey has taken an English patent for preserving wood, as follows: A solution is made of 10 lbs. of powdered potassa and 40 lbs. of powdered lime in 50 gallons of boiling water, and another of 150 gallons of cold water and 40 lbs. of sulphuric acid. These two liquids mixed together form what is called compound No. 1. Next, 50 gallons of crude petroleum, 40 lbs. of asphaltum, 30 lbs. of powdered lime, and 20 lbs. of zopissa are boiled together, and mixed with a pint of sulphuric acid to form compound No. 2. The timber to be preserved is immersed in compound No. 1 for a quarter of an hour, and then dried for a day or two, and afterward it is, by the aid of a tar brush, coated on all sides by compound No. 2.

WELDING IRON.—William Bridges Adams, the well known English engineer, has taken out a patent in England for welding iron, the chief points of which are, that he first makes the surfaces to be joined perfectly true, clean, and close fitting, by planing or otherwise, and then heats them by the aid of jets of gas and air supplied under pressure. Mr. Adams proposes, by the aid of this process, to form guns and other articles by welding together halves or segments which have been prepared by rolling. This specification is well worthy of the attention of those interested in welding.

DRESSING MILLSTONES.—Robert Young, of Glasgow, Scotland, has taken out an English patent for machinery for leveling and dressing millstones by the aid of diamond or other suitable cutters, which have a rectilineal motion only given to them.

BUILDING BLOCKS.—Louis Mumenhoff, of St. Mary's Axe, has taken out an English patent, as a communication from Nicolaus Schroder, of Creuznach, Rhenish Prussia, for compositions for forming blocks to be used for building purposes. One of the mixtures proposed consists of 100 cwt. of coal ashes or coke slag, 16 cwt. of hydraulic cement or lime, and 1 cwt. of Portland cement. The materials are to be worked together in a pug mill, and then rammed into molds. The blocks formed harden in the air, and they may also be further hardened by treating them with waterglass.

PRESERVING WOOD.—Wm. R. Lake, as the agent of Segismund Beer, of New York city, has taken out an English patent for a method of preserving wood by treating it with a boiling solution of borax, the object being to remove the perishable matters without injuring the woody substance. The wood may, if desired, be impregnated with tar or other substances after the above treatment.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

William Mason, of Oregon.—Thirty-nine dollars received of Wells, Fargo & Co., October 8, 1868., said to have been sent by the above. No advices accompany the money; what is it for?

T. J. M., of Ontario.—Neither Babbitt metal or any composition of metals for bearings will so well suit your case as boxes made of hard maple. These can be adapted to the shaft by the use of oil and plumbago. This composition will give a surface for shaft journals fully equal to that of the best anti-friction metals. It will not soon wear out, and will offer less resistance to friction than any other substance with which we are acquainted. In fact, the value of wood as a substitute of metal in mechanical operations and constructions seems, to us, to be very much underrated. An article in a previous number entitled "Mechanical Skill Shown Without Mechanical Appliances" gives some facts that show the adaptability of wood and its use in machinery.

N. H. D., of Mich.—A hollow iron bar containing the same amount of metal as a solid one, and of the same extreme length would resist a greater strain, if suspended by its ends and the weight applied between, than the solid bar. But a solid bar would resist a greater strain of tension or twisting, or of rupture by being drawn longitudinally apart, than a hollow one of the same diameter, as in evident by comparing a one inch bar of wrought iron and a gas pipe of similar diameter.

H. R. P., of Mass.—A pan of water set upon a hot stove will sometimes commence and continue rocking for a while; why is it? Ans. —The heat generates vapor of water, or steam at the bottom which in expanding between the stratum of water and the bottom of the pan, reacts upon it and sets it to rocking, provided the bottom is not perfectly flat. The sudden expansion of the cold metal of the pan might also be supposed to account for the fact; *vide* the old experiment of a hot bar of iron laid across two edges of cold metal described in text-books on physics. The matter you claim as a discovery, we cannot notice unless you transmit to us the evidence that you are the discoverer, and the methods by which you demonstrate the fact.

J. C. S., of Mass., writes us to ascertain the chemical process by which cotton is separated from wool, which he says is well known to manufacturers in this country and in Europe. Will any of our correspondents give us the information?

A. G. C., of———To make iron combine with sulphur you should first heat the iron. It may be successfully done, however, by projecting into a red hot crucible, little by little, a mixture of sulphur and iron filings, maintaining all the while a high temperature. When all has been put in the crucible it should be covered and the mass heated until it fuses.

R. B., of N. J.—There are patent signals which would be very useful to notify passengers when approaching stations, and it is the fault of railroad companies that such signals are not in use.

G. C. of Ohio.—A State court has no jurisdiction in patent causes where the trial in for infringement, but if a fraud has been practiced upon you, you can commence suit in a state court.

R. A., of Pa.—If a party has been using your invention, the very fact of such use is good evidence of its utility, and would assist you in maintaining a claim for damages.

C. and P., of Ky.—It is a frequent occurrence to receive electric sparks from large belts running at high speed. Those you described had probably no connection with the meteoric shower occurring at the time.

H. B. C., of Pa., writes us that iron turnings in Pittsburgh are worth from fifteen to eighteen dollars per gross tun, delivered at the iron mills for manufacture.

C., of Mass.—The concave lens of an opera glass, only produces sufficient divergence in the rays conveyed by the convex lens that distinct vision is produced. Being placed within the focal distance of the convex lens, no inversion takes phace.

B. F. K., of N. Y.—Soapstone is found at Grafton, Athens, Westfield, and Marlborough, Vt., and in many other places, in N. H., Mass., N. C., Md., and Va. It can be made into slate pencils by sawing.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING DECEMBER 15, 1868.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On filing each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design (three and a half years)	$10
On filing application for Design (seven years)	$15
On filing application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

For copy of Claim of any Patent issued within 30 years....................**$1**

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from....................**$1**
upward, but usually at the price above named.

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them....................**$1 25**

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

84,851.—SLIDE FOR HANGING UPRIGHT SAWS.—Ashbel P. Barlow, St. John, Canada.

84,852.—SIDE SCRAPER FOR WELLS.—Elias Beach, Titusville, Pa.

84,853.—OIL INJECTOR FOR STEAM AND OTHER ENGINERY.—Robert Brayton, Fremont, Ohio.

84,854.—INSTRUMENT FOR ACUPUNCTURATION.—Anson R. Brown, M. D., Albion, Mich.

84,855.—MODE OF PRESERVING BAIT FOR FISHING.—Edward E. Burnham (assignor to himself and George Brown), Gloucester, Mass.

84,856.—ROOFING COMPOSITION.—Bork Capron, Lee Center, N.Y.

84,857.—HARVESTER RAKE.—R. Carkhuff (assignor to himself and T. H. Wilson), Lewisburgh, Pa.

84,858.—CHURN.—James Carleton, Walla Walla, Washington Territory.

84,859.—FIRE SHIELD.—John C. Clarke, La Grange, Mich.

84,860.—HAIR CUTTING SHEARS.—L. D. Craig, Nevada City, Cal.

84,861.—HEEL FOR BOOTS AND SHOES.—Albert O. Crane, Boston, Mass.

84,862.—BOOT JACK.—Joseph Darden, Washington, D. C.

84,863.—BRICK MACHINE.—James C. Dean, Chicago, Ill.

84,864.—GASKET PACKING FOR STEAM AND OTHER ENGINERY.—Byron Densmore, New York city.

84,865.—GAME OF COLORS.—Charles H. Douglas, Hartford, Conn.

84,866.—PROCESS OF SCREENING CHARCOAL.—J. S. Evans, Irondale, Mo.

84,867.—COMPOUND FOR DESTROYING INSECTS.—Wm. R. Fairbairn, Ridotte township, Ill.

84,868.—METHOD OF ATTACHING KNOBS TO THEIR SPINDLES.—Wm. A. Fenn, Wolcott, N. Y.

84,869.—BLANK BOOK.—Herman Fischer, Chicago, Ill.

84,870.—MACHINE FOR DISTRIBUTING FERTILIZERS.—John F Fisher, Greencastle, Pa., assignor to himself and Daniel Breed, Washington, D.C.

84,871.—SHOEMAKERS' BENCH.—David Fisk, and J. M. Blodgett, Clyde, N. Y.

84,872.—LOOM.—Wm. T. Flinn (assignor to Barton H. Jencks), Bridesburgh, Pa.

84,873.—BELAYING CLEAT.—Charler S.H.Foster, Deer Isle, Me.

84,874.—MENTSRUAL RECEIVER.—Theodore A. Gamage, Boston, Mass.

84,875.—PIPE COUPLING.—Hachadoor P. Garbadian, Philadelphia, Pa.

84,876.—CORN HUSKER.—J. Irving Gordon, Sing Sing, N. Y. Antedated Dec. 11, 1868.

84,877.—TILE EOR FLOORS, SIDEWALKS, ETC.—John Gray, San Francisco, Cal.

84,878.—MODE OF FASTENING INDIA-RUBBER TIRES ON CARRIAGE WHEELS.—J. Ashton Greene, Brooklyn, N.Y.

84,879.—SULKY HARROW.—E. W. Hewitt, Pacatonia, Ill.

84,880.—SPIRIT LEVEL.—Collins F. Hill, Hamilton, Ohio. Antedated Dec. 8, 1868.

84,881.—METALLIC LATH.—Isaac V. Holmes, New York city.

84,882.—MANUFACTURE OF FANS.—Edmund S. Hunt, Weymouth, Mass.

84,883.—ROCK DRILL.—Michael Keefer, Millstone Point, Md.

84,884.—DOVETAILING MACHINE.—Charles F. Kuhnle, Washington, D. C.

84,885.—FISHING TACKLE.—J. D. Leach, and Sabin Hutchings, Penobscot, Me.

84,886.—REVOLVING PILE HOOK.—J. D. Leach, and Sabin Hutchings, Penobscot, Me.

83,887.—HARVESTER.—Samuel K. Lighter and Joseph Curtis, Hamilton, Ohio. Antedated Dec. 3, 1868.

84,888.—APPARATUS FOR COOLING LIQUIDS ON DRAFT.—Joseph Link, United States Army.

84,889.—GAS HEATER.—David H. Lowe, Boston, Mass.

84,890.—COVER FOR FUEL MAGAZINE IN BASE BURNING STOVES.—Egbert Macy (assignor to John H. Keyser), New York city.

84,891.—SEAL-BOLT FOR RAILWAY Cars.—Peter H. Mann, and Griffith P. Terry, Albany, N.Y., assignors to Andrew B. Uline, and G. G Kidder.

84,892.—WAGON BOX.—Thomas H. Marcy, Windham, Ohio.

84,893.—PROCESS OF CURING HAMS, BEEF, AND OTHER MEATS.—Oliver M. Martin, Ann Arbor, Mich.

84,894.—PLATE OR SALVER.—H. McManus and John B. Hatting, New York city.

84,895.—WHEAT DRILL.—Daniel McSherry, Dayton, Ohio.

84,896.—RAILWAY SWITCH SIGNAL.—I. Ferguson Morsell, Stamford, Conn.

84,897.—STAVE MACHINE.—Charles Murdock, Hartford, Conn.

84,898.—WAITER MACHINE.—Daniel F. Myers, New York city.

84,899.—FASTENING FOR CORSETS.—Peter H. Niles and Frank W. Marston, Boston, Mass. Antedated Dec. 2, 1868.

84,900.—GROMMET.—Joseph W. Norcross, Boston, Mass. Antedated Nov. 30, 1868.

84,901.—BRICK MACHINE.—John W. Pease, (assignor to himself, Leonard Willets and Isaac Willets), Belmont, N. Y.

84,902.—BUTTON-HOLE CUTTER.—William S. Porter, Boston, Mass.

84,903.—CLOTH-MEASURING APPARATUS.—John Edwin Race and Aaron Smith, Chicago, Ill.

84,904.—MACHINE FOR WASHING PRINTERS' INK-ROLLERS.—O. H. Reed and Asa L. Carrier, Washington, D. C.

84,905.—APPARATUS FOR SHEARING SHEEP.—Hiram A. Reid, Beaver Dam, Wis.

84,906.—CIGAR CASE.—Selden N. Risley, Brooklyn, N. Y.

84,907.—MACHINE FOR RIVETING HINGES.—Henry M. Ritter, Covington, Ky.

84,908.—BAKING PAN.—Sullivan W. Rogers, Harwich, Mass.

84,909.—CLAMP FOR SUSPENDING PASTE-BOARD AND OTHER FABRICS.—Edwin H. Sampson, Boston, Mass.

84,910.—HAND CULTIVATOR.—John Scheiblin and John Heitzman, Philadelphia, Pa.

84,911.—CULTIVATOR AND PLOW.—Samuel F. Seely, Whitford, Mich. Antedated Dec. 11, 1868.

84,912.—PUMPING-ENGINE.—Thomas Shaw, Philadelphia, Pa., assignor to himself and Philip S. Justice.

84,913.—WINDOW-SHUTTER.—S. M. Sherman, Fort Dodge, Iowa.

84,914.—AUTOMATIC STOP COCK FOR GAS BURNERS.—George E. Smith, San Francisco, Call.

84,915.—HAT IRONING MACHINE.—George W. Stout and John C. Richardson, Newark, N. J. assignor to themselves, James Davis, Jr., and S. R. Hawley, assignors to said Stout, James H. Prentice, said Davis, Jr., and Hawley.

84,916.—SAW GRINDER.—Elias Strange, Elias W. Strange, and Emerson C. Strange, Taunton, Mass.

84,917.—HORSE RAKE.—Edwin J. Toof, Fort Madison, Iowa.

84,918.—WASH-BOILER.—Charles N. Tyler, New York city.

84,919.—CLOTHES LINE REEL.—John Valentine and Henry B. Stevens, Buffalo, N. Y.

84,920.—BASE BURNING STOVE.—Henry B. Van Benthuysen, Emprorium, Penn.

84,921.—MILK CAN.—H. M. Viets, Carlisle, Ohio.

84,922.—BREECH-LOADING FIRE-ARM.—Ernest Von Jeinsen, New York city.

84,923.—HYDRAULIC WASH BOILER.—J. B. Waring, Brooklyn N. Y., assignor to Hiram Duryea, New York city, assignor to E. W. Dickson, Chelsea, Vt.

84,924.—WASHING MACHINE.—Aretus A. Wilder and John Wilder, Detroit, Mich.

84,925.—BELT FATENER.—G. Greenleaf Wilson, Nashua, N. H.

84,926.—CLIPPING SHEARS.—John C. Wilson, Adam Walker, and John Foster, New York city.

84,927.—HARVESTER.—George W. N. Yost, Corry, Pa., assignor to the Corry Machine Company.

84,928.—CLOTHES DRYER.—Wm. H. Acker, Tarrytown, N.Y.

84,929.—BREECH-LOADING FIRE-ARM.—Ethan Allen, Worcester, Mass.

84,930.—STOVEPIPE DAMPER.—Levi O. Allen, Gardiner, Me.

84,931.—CULTIVATOR.—Clark Alvord, Westford, Wis.

84,932.—MODE OF PLATING SCALES WITH HARD RUBBER, FOR THE MANUFACTURE OF CUTLERY, AND FOR OTHER PURPOSES.—Fordyce Beals, New Haven, Conn.

84,933.—CAR COUPLING.—W. G. Bell, Pitsburgh, Pa.

84,934.—MODE OF RECOVERING USEFUL PRODUCTS FROM THE WASTE LIQUOR OF GELATIN FACTORIES.—Frederick Bihn, and William Schrader, Frankford, Pa.

84,935.—CULTIVATOR.—Joseph H. Brinton, Thornbury township, Pa.

84,936.—CORN PLANTER.—John D. Chambers (assignor to himself and Erasmus D. Rowland), Carthage, Mo.

84,937.—HEAD BLOCK.—John F. Cook (assignor to George F. Page, Joseph Roberts and George L. McCahan), Baltimore, Md.

84,938.—BREECH-LOADING FIRE-ARM.—Joseph R. Cooper, Birmingham, England.

84,939.—HOISTING AND DUMPING APPARATUS.—W. B. Culver, Scranton, Pa.

84,940.—AXLE.—Edward Finn, Be lin, Wis.

84,941.—PORTALE GAS APPARATUS.—William Foster, Jr., and George P. Ganster, New York city.
84,942.—MUZZLE FOR SHOT GUNS.—John Fry, Latrobe, Pa.
84,943.—DRESSING GLASS REFLECTOR.—Charles Furber, London, England.
84,944.—LOOKING GLASS SUPPORT.—William H. Grey, New York city. Antedated December 8, 1868.
84,945.—GATE LATCH.—Benjamin Hendrickson, Huntington, New York.
84,946.—PLOW.—W. Upton Hoover, Daysville, Ky.
84,947.—SCHOOL DESK AND SEAT.—Alfred Hutchinson (assignor to himself and Stephen H. Markley, Philadelphia, Pa.
84,948.—DEVICE FOR PUMPING, ETC.—John Johnson, Saco, Me.
84,949.—BEDSTEAD FASTENING.—Wm. Johnson, Appleton, Wis.
84,950.—REVOLVING INKSTAND.—J. M. Kennedy, Vicksburg, Mississippi.
84,951.—SUSPENDER FOR SCISSORS.—J. H. Kuttner, Hempstead, Texas.
84,952.—STREET LAMP.—Frederick Lange (assigner to himself and Egmond Lichtenberger, Chicago, Ill.
84,953.—CHURN DASHER.—Eli H. Lord and Willard Thomson, Homer, N. Y.
84,954.—WRIST PAN TURNER.—Philo Maltby, Cleveland, Ohio.
84,955.—PROPAGATING BOX.—Albert D. Manchester, Westport, Mass.
84,956.—HARROW.—B. T. Martin, Charlotte, Mich.
84,957.—PLOWING HOE.—Thomas J. Mason, Harmony, Me.
84,958.—HORSESHOE.—J. J. Merversp, New York city.
84,959.—SEWING MACHINE.—Nicholas Meyers, Buffalo, N. Y.
84,960.—KNIFE CLEANER.—William Miller, Chicopee, Mass.
84,961.—GAS SOCKET.—George Mooney (assignor to Mooney, Arnold, and Shaw), Providence, R. I.
84,962.—APPARATUS FOR TURNING THE LEAVES OF MUSIC BOOKS.—Amos Knights Noyes, Lynn, Mass.
84,963.—RAILWAY CAR BRAKE.—D. J. Parmele, San Francisco, Cal., assignor to himself and J. H. Currier, Springfield, Ill.
84,964.—TOOL FOR CUTTING MOLDINGS.—D. W. Perry (assignor to himself and O. K. Moore), Wilkesbarre, Pa.
84,965.—SANITARY BRACE TO KEEP THE MOUTH CLOSED DURING SLEEP.—F. Pinckard, New Orleans, La.
84,966.—STOVE DOOR HANDLE.—William F. Redding, Saratoga Springs, N. Y.
84,967.—MANUFACTURE AND APPLICATION OF GAS FOR VARIOUS USEFUL PURPOSES.—Peter Salmon, London, Eng.
84,968.—BELT HOOK.—Charles G. Sargent, Graniteville, Mass.
84,969.—RAILROAD CAR-HEATING APPARATUS.—Elihu Spencer, Elizabeth, N. J.
84,970.—PLOW.—J. L. Stearns, Mahomet, Ill.
84,971.—MILLSTONE DRESS.—Benjamin C. Stephens, Houston, Missouri.
84,972.—BOX FOR PILLS, ETC.—Benjamin F. Stephens, Brooklyn, N. Y.
84,973.—MILK CAN.—L. A. Sunderland, Chagrin Falls, Ohio.
84,974.—FASTENING FOR NECK TIES.—Dennis H. Tierney, Waterbury, Conn.
84,975.—CHANDELIER.—James F. Travis, New York city.
84,976.—REVOLVING FIRE-ARM.—Frank Wesson, Worcester, Massachusetts.
84,977.—STEAM HEATER.—Phineas D. Wesson, Providence, R.I.
84,978.—WATER BACK FOR STOVES AND RANGES.—Stephen Wilks, Chicago, Ill. Antedated December 9, 1868.
84,979.—SLED BRAKE.—James Willis, Mifflin, Wis.
84,980.—CHEESE TABLE.—E. L. Yancy, Batavia, N. Y.
84,981.—MANUFACTURE OF ILLUMINATING GAS, WITH OTHER PRODUCTS.—John Absterdam, New York city.
84,982.—BALING PRESS.—James M. Albertson, New London, Ct.
83,983.—DEVICE FOR SINGEING HORSES.—Jabez Alexander, Nashua, N. H.
84,984.—DOOR AND SHUTTER FASTENER.—Joseph Auser, Mount Vernon, N. Y. Antedated December 12, 1868.
84,985.—RUBBER ERASER.—William N. Bartholomew, Newton Center, Mass., assignor to Joseph Reckendorfer, New York city.
84,986.—ASH SIFTER.—F. G. Beach, Hartford, Conn.
84,987.—SASH FASTENER AND ADJUSTER.—Alma Bedford, Coldwater, Mich.
84,988.—DENTISTS' FLASK.—C. P. Bellows, Gloversville, N. Y.
84,989.—RADIATOR.—Edward S. Blake, Pittsburg, Pa.
84,990.—BELL PULL.—Sterling Bonsall, and Louis Hillebrand, Philadelphia, Pa.
84,991.—PUMP.—J. F. Brickley, Winchester, Ind.
84,992.—STEAM ENGINE THROTTLE VALVE.—Henry C. Bull, and Samuel T. Shelley, Louisville, Ky.
84,993.—LAMP BURNER.—Charles W. Cahoon, Portland, Me.
84,994.—BEE HOUSE.—W. Carter, St. Louis, Mo.
84,995.—VAPOR AND STEAM CONDENSER, TO BE APPLIED TO BREWERS' BOILERS AND LIKE APPARATUS.—C. Clifford, Fulton, N. Y.
84,996.—LIQUID COOLER.—William A. Colsten, Great Bend, Pa.
84,997.—FIRE ALARM.—Jesse Coulson, Oskaloosa, Iowa.
84,998.—BAG TIE.—David Dick, and Oliver W. Preston, Jr., Corning, N. Y. Antedated December 9, 1868.
84,999.—HORSE HAY RAKE.—A. T. Dunbar, Alba, Pa.
85,000.—STEAM GENERATOR.—Francis B. Dunn, New York city.
85,001.—CULTIVATOR.—George M. Dwight, Oregon, Ill.
85,002.—PORTABLE PUMP.—F. Eichler, New Lisbon, Wis.
85,003.—SOLDERING MACHINE.—Valentine Fath, Philip Fath, and Julius Frielingdorf, St. Louis, Mo.
85,004.—SIGNAL LANTERN.—John Graham, Grafton, W. Va.
85,005.—PREPARATION OF SULPHATES, AND THE MANUFACTURE OF FINE SILVER THEREFROM.—F. Gutzkow, San Francisco, Cal.
85,006.—SLOW CLOSING VALVE FOR WATER CLOSETS.—Charles Harrison, New York city.
85,007.—GRAIN DRYER.—Henry Henley, Shoals, and John J. Reinhart, Loogootee, Ind.
85,008.—CARRIAGE SPRING.—Frank A. Huntington, San Francisco, Cal.
85,009.—MACHINE FOR CUTTING AND SPLITTING WOOD.—Anthony William Jackson, La Crosse, Wis.
85,010.—PULVERIZER, LEVELER, AND MARKER.—Lewis Jones, Funk's Grove, Ill.
85,011.—COMBINED CORN CRIB AND THRESHING FLOOR.—Joseph R. Jordan, and James Campbell, West Alexandria, Ohio.
85,012.—APPARATUS FOR TIGHTENING BELTS.—James M. King, Quincy, Minn.
85,013.—HARNESS PAD DRESS.—George W. Lawbaugh, Genesco, Ill.
85,014.—PORTABLE AND STATIONARY LANTERN.—Lemuel W. Leary, Norfolk, Va.
85,015.—MODE OF PREPARING CARBONATED AND CAUSTIC ALKALIES, ETC.—Karl Lieber, Charlottenburg, near Berlin, Prussia, assignor to E. J. Keferstein, Washington, D. C.
85,016.—CURTAIN FIXTURE.—Albert Lovie, Philadelphia, Pa., assignor to Charles F. Steinbach.
85,017.—TOY PISTOL.—Thomas E. Marable, Petersburg, Va.
85,018.—MATERIAL FOR THE MANUFACTURE OF BOXES, PICTURE FRAMES, BUTTONS, INSULATORS, INKSTANDS, AND OTHER ARTICLES.—John Mudge Merrick, Jr., Boston, Mass., assignor to New England Vulcanite Hide Company.
85,019.—SPADING MACHINE.—Loring Moody, Malden, Mass.
85,020.—MANUFACTURE OF KNIVES AND FORKS.—Charles A. Moore, Westbrook, Conn.
85,021.—CYLINDRICAL SAW.—Charles Murdock, Hartford, Conn.
85,822.—MACHINE FOR GRINDING GLASS FRUIT JARS.—Michael Neckermann, Pittsburg, Pa.
85,023.—PORTABLE WARDROBE.—Gerrit Niermann, Cincinnati, Ohio.
85,024.—MACHINE FOR CLEANING COTTON.—Benjamin J. F. Owen, Memphis, Tenn.
85,025.—WAGON BRAKE.—D. J. Owen, Springville, Pa.
85,026.—CHURN.—S. R. Owen, Stewartsville, Mo.
85,027.—STEERING APPARATUS.—S. C. Richards, St. Louis, Mo.
85,028.—MACHINE FOR TRIMMING WELTED SEAMS.—William H. Rounds, North Bridgewater, Mass.
85,029.—FOUNTAIN LAMP.—M. Samuels, New York city.
85,030.—MODE OF SHAVING AND POLISHING SKINS.—Christian Schmitz, Philadelphia, Pa.
85,031.—WASH BOILER.—Edward Seeley, Scranton, Pa.
85,032.—REPAIRING WHIPS.—C. R. Shelton, New Haven, Ct.
85,033.—FARM GATE.—Daniel Shockey, Waynesborough, Pa.
85,034.—CAR BRAKE.—L. S. Sisson, West Edmeston, N. Y. Antedated December 5, 1868.
85,035.—CORN SHELLER.—J. P. Smith, Hummelstown, Pa.
85,036.—NECK-TIE.—W. S. Smoot, Washington, D. C.
85,037.—MACHINE FOR MAKING PAPER COLLARS.—Charles Spofford, and Charles H. Montague, Boston, Mass.
85,038.—PLATE FOR ARTIFICIAL TEETH.—Leander R. Streeter, Chelsea, Mass.
85,039.—DRAFT EQUALIZER.—Richard Walker, and George Trumbull, Batavia, N. Y.
85,040.—SHUTTLE FOR SEWING MACHINES.—Albin Warth, Stapleton, N. Y., assignor to himself and Eberhard Faber.
85,041.—HAT CONFORMATOR.—E. Z. Webster, Norwich, Conn.
85,042.—BURNING KILN.—Gustav A. Wedekind, and Helmuth Dueberg, New York city.
85,043.—RIDDLE FOR GRAIN SEPARATORS.—George A. Wells, Oskaloosa, Iowa.
85,044.—HARVESTER RAKE.—Cyrenus Wheeler, Jr., Auburn, N. Y.
85,045.—HARVESTER.—William N. Whiteley, Springfield, Ohio.
85,046.—CHILL FOR CASTING CAR WHEELS.—William Wilmington, Toledo, Ohio.
85,047.—LAMP CHIMNEY.—S. R. Wilmot, Bridgeport, Conn.
85,048.—SLUICE GATE.—John S. Wilson, Harveysburg, Ohio.

REISSUES.

49,039.—MANUFACTURE OF PAPER STOCK.—Dated August 1, 1865; reissue 3,228.—Henry Betts, Norwalk, Conn.
64,492.—SASH STOP.—Dated May 7, 1867; reissue 3,229.—Charles Clapp (assignee of Calvin Cole), Ithaca, N. Y.
83,770.—MATERIAL FOR THE MANUFACTURE OF BOXES AND OTHER ARTICLES.—Dated November 3, 1868; reissue 3,230.—Maurice Fitzgibbons, New York city.
73,823.—DIE PRESS.—Dated January 28, 1868; reissue 3,231.—John Mays, and Eliphalet W. Bliss, Brooklyn, N. Y.
74,168.—LIFE-PRESERVING APPARATUS.—Dated February 4, 1868; reissue 3,232.—John B. Stoner, Leopold Mendelson, and Theodore Crommelin, New York city, assignees of John B. Stoner.
65,238.—MACHINE FOR RUBBING AND MIXING PAINTS, CHEMICALS, FERTILIZERS, ETC.—Dated May 28, 1867; reissue 3,233.—Robert Poole, Baltimore, Md.
30,509.—BELL ATTACHMENT.—Dated October 23, 1860; reissue 3,234.—A. E. Taylor, New Britain, Conn.
39,439.—BRUSH.—Dated August 4, 1863; reissue 3,235.—John L. Whiting, Boston, Mass.

DESIGNS.

3,291.—CABINET ORGAN CASE.—Franz Doerschuck, New Haven, Conn.
3,292.—FORK OR SPOON HANDLE.—Henry H. Hayden, New York city, assignor to Holmes, Booth, and Haydens, Waterbury, Conn.
3,293 to 3,295.—FLOOR CLOTH PATTERN.—Charles T. Meyer, Bergen, N. J., assignor to Edward C. Sampson. Three patents.
3,296.—FIGURE.—Carl Muller (assignor to Nicholas Muller), New York city.

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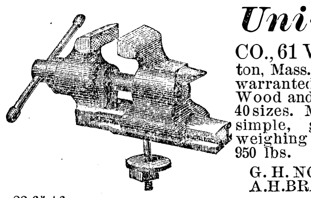

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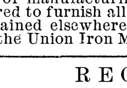

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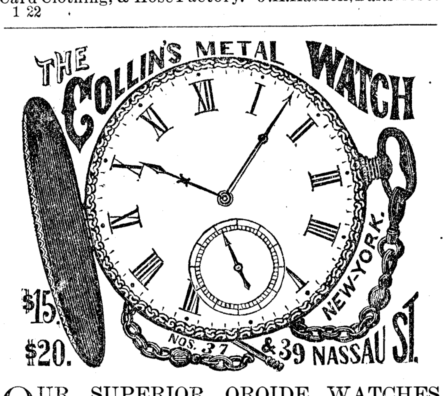

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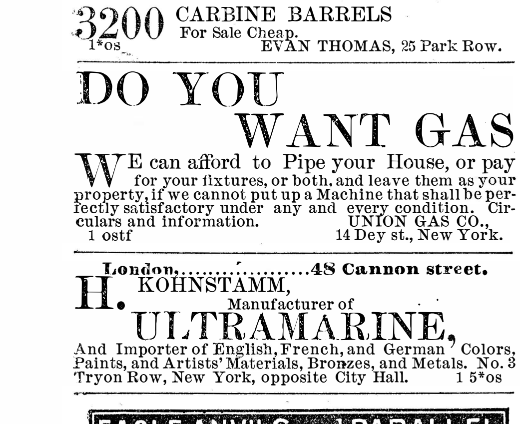

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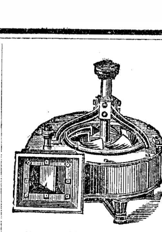

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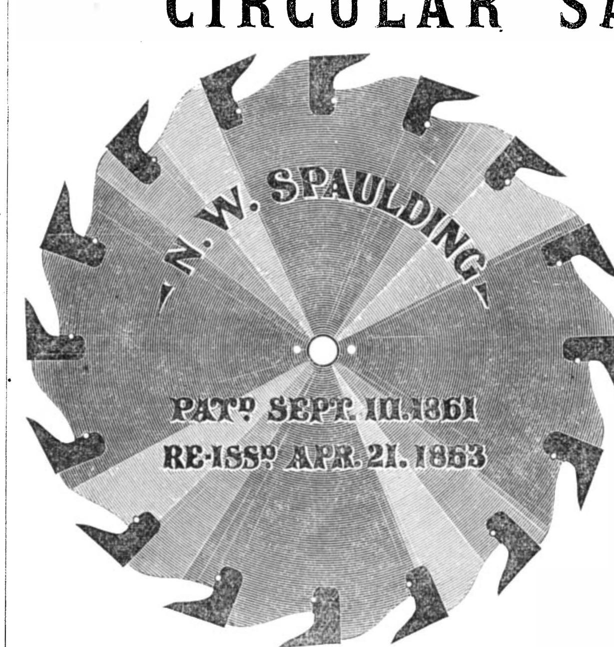

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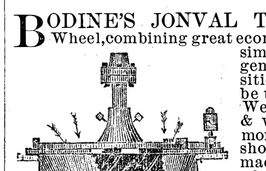

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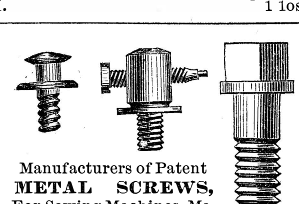

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