the boiler, and if the iron was bad at the time of the rupture, it was so at the time of the test; third, that even the seam, one inch below the line of fracture—a weaker line to resist pressure than the chisel-mark line—also parallel with the line of fracture, was s rong enough at the time of the test. Therefore we must conclude that there was a sudden increase of pressure at the time of the accident, not shown by or noticed on the steam gage; or, the boiler was weakened after the test and previous to the rupture. Both boilers were connected together by a large steam pipe, consequently there was nearly the same pressure at all times in each. Three other places on the two boilers had the same radius of rounded surface, with the same adjustment of the stays.

It is well known that iron will receive a permanent set, with less than half the strain at which it will be ruptured; and, therefore, evidences of bending or stretching in some of the three places should be found, but cannot on the boilers now.

It was not noticed, in this case, that any part of the engine was disarranged by great pressure; neither did the engine make a few turns more rapidly than usual, and I have never heard that such evidences of over pressure have been noticed in any case of explosion. Therefore, I conclude there was a sudden or gradual weakening of the boiler—perhaps both—previous to the rupturing, and after the test was applied. The fracture occurred along the low-water line. If the sheet was at a higher temperature on one side of the line of fracture than on the other, the sheet would be weakened to resist pressure from the unequal expansion, and, it is well known, that the sheet might be broken by unequal heating without any other force acting upon it. I have applied thermometers near the places of rupture, and found a temperature below of 269°; above, of 500° On another occasion 260° below, 395° above; again 260° below and 480° above, since which the thermometer above, remaining on the boiler, has been exposed to a temperature of 630°—for the mercury boiled. If it is claimed that the thermometers were not correct, I would refer to the fact that the fitting on the steam pipe is burned to charcoal.

I am of the opinion that the result of these observations amounts to a demonstration that the boiler of the *St. John* was ruptured by the unequal expansion of the boiler iron—a theory which I claim to have discovered and proved. Knowing the cause, and the manner of its operation, it is easy to provide a remedy, which, in time, will be furnished.

Explosions of boilers that occur outside of a ship or steamboat are usually less disastrous than those where the boiler is inclosed. When the steam has to break into a cabin, it does less damage than when it has to break out; in the latter case the hot steam is restrained from expanding to some extent, and its heat is greater to scald and burn. The pressure in the same way acts on a large interior surface when the explosion is outward, while, when the boiler is on the "guards," its force is principally expended upon the open air.

I think we should endeavor to avoid charging inspectors, engineers, and mechanics with inefficiency or dishonesty as far as possible, for they are usually men who are to be respected, and whose only capital is their reputation, and rather seek for an explanation of the phenomenon which shows such accidents to be beyond their control.

NORMAN WIARD.

No. 46 Pine street, New York.

[There is nothing new in the fact that the temperature may be quite different in different parts of a steam boiler. We have seen a boiler that had, at the same instant, ice in the bottom, boiling water above, saturated steam of 282° temperature above the water, and superheated steam of considerably higher temperature in the top.—EDS.

[Scarcity of Water for a Steam Engine.

MESSRS. EDITORS:—I am getting up a steam power, but am not practically acquainted with the business. My great lack, if any, will be the want of water. I draw my water from a cistern, to supply which I have to depend upon rain. My cistern is situated at a distance of about twenty feet horizontally from the boiler and about eight feet vertically. Now I wish to inquire how you think it would work to run my escape pipe into the top of the cistern in order to condense the steam. If it will not do to run the steam into the cistern, then what form of condenser will be best, and about how much of a saving can be made in that way? H. S. A.

Kirkwood, Mo., Nov. 25, 1865.

[You cannot condense steam without sufficient water. By running the pipe into the cistern the engine would work for a time until the water became heated, when it would stop. Air condensers have been tried—that is, exposing the exhaust to a large area of surface cooled by air passed through it by a blower; but the vacuum obtained was very little. It is possible that you might save your water in this way, but we do not advise the experiment. Can you not sink a well?—EDS.

Correction.

MESSRS. EDITORS:—When I state that a portion of my observations on the *Algonquin* and *Winooski* trials, containing an extract from the London *Engineer*—the ablest mechanical journal in England—which completely sustains my position in relation to these trials—was omitted in the publication of my communication in the last issue of your valuable journal, I think that I may rightfully complain of injustice. Particularly so as I was subjected to severe editorial criticism in comparing my view of the case to a certain experiment with salt in guano.

I decidedly object to have my claws pared, as Æsop relates happened to a love-sick lion, and then to be cudgeled. NAVAL ENGINEER.

New York City, Dec. 8, 1865.

[The article in the *Engineer*, alluded to, had been already extracted from it into our columns, and in our comments upon it we had expressed our surprise that the editor of that paper should suppose that any principle could be settled by such a series of experiments. The following is the extract which our correspondent wishes inserted.—EDS.]

"The New York trial, short as it was, has utterly demolished Mr. Isherwood's arguments, and proved to a demonstration the accuracy of the principles adopted by our most successful engineers for years past."

To Clear a Boat of Water without Baling.

MESSRS. EDITORS:—I write you a few lines in regard to baling out boats, and if you think them worth laying before your readers, you are at liberty to do so.

If you have a boat that leaks badly, and it is in a strong current, or if you are towing it up stream, all you have to do to keep it dry is this: bore a hole through the bottom and insert a piece of tin or iron, half round, through the hole, letting it extend a few inches below the bottom of the boat, and all the water will run out without any labor. I think a ship at sea could be kept afloat if you could keep her going four miles per hour. J. S. ROLESTON.

Indiana, Pa., Nov. 19, 1865.

The Russian-American Telegraph.

By way of California we have news of the arriva of the expedition of the Western Union Telegraph Company at Petropolowski, Russian Siberia, on the 16th of October. No accidents have happened. The parties necessary to carry out the project have gone to work vigorously. Every where they have been most cordially received, and have made thorough and extensive soundings in Norton Sound, as far north as Behring's Straits, finding no difficulties in the way. The native tribes in Northern Siberia, who, it was feared might interpose obstacles, seem anxious to assist, and express themselves gratified at the prospect of employment. The party which is to ascend the Anadyr River is probably well advanced. Colonel Bulkley left the party at Plover Bay, with a steamer, intending to visit the gulf of Anadyr. Messrs. Mahon and Bush left Nicholaski, bound also north. The work is being most vigorously prosecuted in all directions. All the parties which it was proposed to dispatch this year are already well started, and, judging of the success of the future by that of the past, it is confidently hoped greater progress will be made during the coming year.

PROF. AGASSIZ is following the upward course of the Amazon River, and has already discovered sixty new species of fish.

REPORT OF THE SECRETARY OF THE TREASURY.

The Secretary of the Treasury, in his annual report, says that the public debt was, on the 30th of October, 1865, $2,808,549,437 55. The following is a statement of receipts and expenditures for the fiscal year ending June 30, 1865:—

Balance in Treasury agreeably to warrants, July 1, 1864		$96,739,905 73
Receipts from loans applicable to expenditures	$864,863,499 17	
Receipts from loans applied to payment of public debt	607,361,241 68	
		1,472,224,740 85
Receipts from customs	84,928,260 60	
Receipts from lands	996,553 31	
Receipts from direct tax	1,200,573 03	
Receipts from internal revenue	209,464,215 25	
Receipts from miscellaneous sources	32,978,284 47	
		329,567,886 66
Total		$1,898,532,533 24
EXPENDITURES.		
Redemption of public debt		$607,361,241 68
For the civil service	$44,765,558 12	
For pensions & Indians	14,258,575 38	
For War Department	1,031,323,360 79	
For Navy Department	122,567,776 12	
For int. on pub. debt	77,397,712 00	
		$1,290,312,982 41
Total		$1,897,674,224 09
Leaving a balance in the Treasury on the 1st day of July, 1865, of		853,809 15

For the year ending June 30, 1866, it is estimated that the expenditures will exceed the receipts to the extent of $112,000,000; but that in the following year the expenditures will be less than the receipts by the sum of $111,000,000. The reciepts for the year ending June 30, 1867, are estimated as follows:—

From customs	$100,000,000 00	
From internal revenue	275,000,000 00	
From lands	1,000,000 00	
From miscellaneous	20,000,000 00	
		$396,000,000 00
The expenditures, according to the estimates, will be:—		
For the civil service	$42,165,599 47	
For pensions and Indians	17,609,640 23	
For War Department	39,017,416 18	
For Navy Department	43,982,457 50	
For int. on pub. debt.	141,542,068 50	
		284,317,181 88
Leaving a surplus of estimated receipts over estimated expenditures, of		111,682,818 12

REPORT OF THE SECRETARY OF WAR.

In the report of the Secretary of War, a genera summary is given of the military campaigns of 1864 and 1865, ending in the suppression of armed resistance to the national authority in the insurgent States. The national military force on the 1st of May 1865, numbered 1,000,516 men. It is proposed to reduce the military establishment to a peace footing, comprehending 50,000 troops of all arms, organized so as to admit of an enlargement by filling up the ranks to 82,000, if the circumstances of the country should require an augmentation of the Army. The volunteer force has already been reduced by the discharge from service of over 800,000 troops, and the department is proceeding rapidly in the work of further reduction. The war estimates are reduced from $516,240,131 to $33,814,461, which amount, in the opinion of the Department, is adequate for a peace establishment.

REPORT OF THE SECRETARY OF THE NAVY.

The Secretary of the Navy states in his report that at the commencement of the present year there were in commission 530 vessels, armed with 3,000 guns, and manned by 51,000 men; the number of vessels at present in commisson is 117, with 830 guns, and 12,128 men.

Since the 4th of March, 1861, 418 vessels have been purchased, of which 313 were steamers, at a cost of $18,366,681 83, and of these there have been sold 340 vessels, for which the Government has received $5,621,800 27.

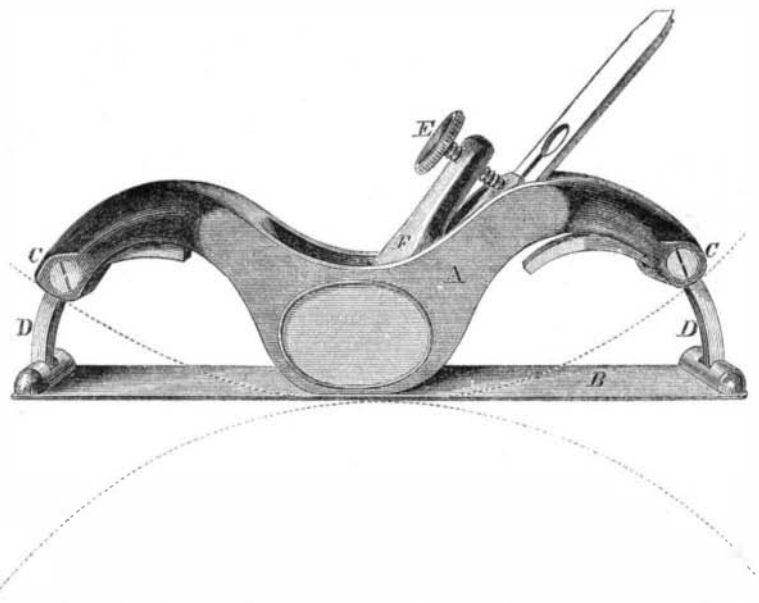
The estimated expenditures for the year ending June 30, 1867, are $23,982,457.

RECEIPTS FOR MONEY.—The Commissioner of Internal Revenue has decided that all letters acknowledging the payment of any sums of money of $20 and upward must bear the two-cent revenue stamp, the same as ordinary business receipts.

Graduating Plane Stock.

Wood-working mechanics have long felt the want of an adjustable hand plane, adapted to finish curved surfaces with accuracy and dispatch. The number of altered wooden plane stocks, etc., fitted to special curves, lying about any large shop, testify to the prevalence of this want. Much time has been wasted in making these alterations, and in the use of such imperfect substitutes as drawing knives, spokeshaves, etc., for the purposes referred to.

The above plane is designed to fully meet the want complained of, as will be readily seen by the accompanying engraving. It consists of a peculiar hollow iron stock, A, to the bottom of which is fitted and strongly riveted a thin, highly polished steel plate, or face, B, so as to bend up or down from the center, at either end, forming a convex or concave surface, as may be required, and of any desired curve. The ends are held in their places by the set screw, C, bearing upon the shank, D, which moves easily in the opening when the screw is relaxed. The cutting iron is of the usual form, and is firmly secured by lever pressure, effected by the use of a thumb screw, E, in the upper end of the wedge, F, acting upon the cap and against a fulcrum rod—not shown in the engraving. The position of the iron may thus be instantly changed without the use of a hammer or other tool. The plane works equally well within or around a circle or upon a level surface. The same principle is also applied to the plow and rabbet plane.



EVANS'S PATENT GRADUATING CIRCULAR PLANE STOCK.

The patent for this plane was issued through the Scientific American Patent Agency to Geo. F. Evans, of Maine, and has been assigned to R. H. Mitchell & Co., of Hudson, N. Y., by whom the planes are now manufactured, and to whom all letters may be addressed or to F. H. Webb, general agent, Hudson, N. Y.

Improved Self-guiding Gage.

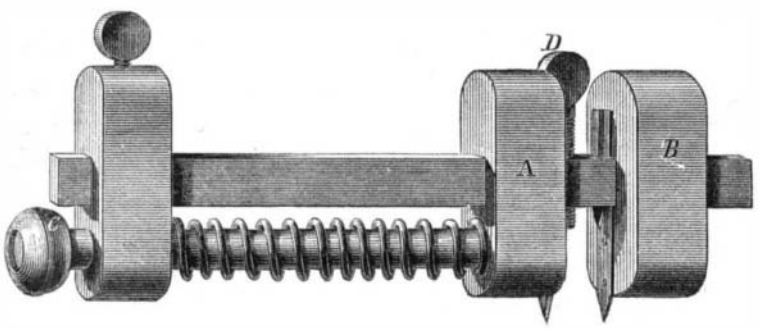
This gage is more especially intended for gunsmiths and cabinet-makers, or others using a lance gage, to divide instead of sawing thin stuff. For gunsmiths' use it is intended to make the last cut in fitting in the barrel. The stock is to be planed out in the usual way until the two side cuts are to be made which lets in the barrel. The barrel is then to be secured in place by a clamp at the muzzle, and secured at the breech pin in any convenient way so as to be steady; then, after seeing that the barrel is set so that it will be level when let in, draw the loose head containing one of the lance points far enough from the stationary head containing the other lance point to allow the barrel to be embraced by the cutters; then, by shoving the gage steadily along the barrel, the wood will be divided so as to make a good fit.

In some instances this gage is made with circular cutters or disks properly secured to the sliding heads, A. Aside from its uses as a gage for gunsmiths, it is very useful to cabinet-makers, joiners, pattern makers, and, in fact, all wood workers. For rabeting out a joint this gage is a capital guide, as it makes a deep, straight, and clean incision in the wood. The engraving explains itself. It may be well to add that there is a nut, C, on the end, which serves to adjust the sliding head, B, to minute fractional parts of an inch. The set screw, D, between the heads is for the purpose of gaging the depth to which the cutters work.

It was patented through the Scientific American Patent Agency on July 11, 1865, by James McCrum; for further information address him at Locust Grove, Adams Co., Ohio.

A Patent Sold for a Large Sum.

The sums occasionally paid for patents seem fabulous when considered in the light of ordinary commercial transactions. But they are not ordinary transactions, and that is the reason why high prices are paid for them. Men, in the early days of California, picked up large nuggets of great value lying on the surface, and realized upon them "at sight," and so, in a measure, inventors find nuggets, but not always at sight, for it often costs years of study to know just where to look for them. Mr. Joel Green, whose apparatus for deodorizing petroleum is illustrated on the first page of this number, sold the patent for $200,000, and steps are being taken to put it in operation. It has been examined by Prof. Doremus and others, and is said to be successful.



M'CRUM'S SELF-GUIDING GAGE.

PNEUMATIC DISPATCH.

The editor of the *Mechanics' Magazine* recently rode with eight other passengers through the portion of pneumatic dispatch tube which is completed, and he gives some facts in relation to the new mode of locomation:—

"The line just opened is a mile and three-quarters in length, and the cost is stated, at a rough calculation, to be some £30,000 or £35,000 per mile.

"The straight portions of the line are formed of a continuous cast-iron tube, the curved portions being constructed in brickwork. The sharpest curve is that near the Holborn Station, which is 70 feet radius. The line passes beneath Seven Dials on a curve of 300 feet radius, and on leaving the direction of Tottenham-road court for the Euston Station a curve of 170 feet radius occurs.

"The cast-iron tube is of the horseshoe section, the internal dimensions being 4 feet 6 inches horizontally, and 4 feet vertically. The tube is cast in 9 feet lengths, each length weighing about two tuns. In the experimental lines the rails are cast on the floor of the tube, but in the present case a wrought-iron rail is used, which is bedded on longitudinal timbers. The chief gradients on the line are 1 in 40, 1 in 45, and 1 in 60, some portions of the line being on the level. The average distance between the level of rails and the road level above is 9 feet. This depth enables the tube to take a general position over the sewers and under the gas and water pipes, leaving each in the undisturbed possession of its own locality.

"The trucks, which are about 10 feet in length, resemble in form the ordinary railway open goods wagons, the ends being raised above the sides and presenting an outline conforming to that of the interior of the tube. The edges of the truck ends are bound with an elastic medium, although a slight space is left between the trucks and the face of the tube, a perfect vacuum not being indispensable to the working of the line. It is found that no inconvenience arises from leakage, while, in the case of a close fit, the results of friction would prove perjudicial. The trucks are constructed of wood cased with iron; the wheels revolve in excavated circles, and are thus flush with the sides. Each truck weighs of itself about a tun, and its load is, on an average, one tun and a half. The trains which were run on the occasion of the opening consisted of four trucks which, with their loads, represented a gross total load of 10 tuns. This weight was sent from Holborn to Euston with a blowing pressure of from 5 ounces to 6 ounces per square inch. It was afterward drawn by exhaustion from Euston to Holborn at a pressure of from about 4 to 5 ounces, the time occupied in each journey being about seven minutes. In ordinary steady working, twenty-four trains have been run in four hours, or equal to two hundred and forty tuns gross load conveyed in four hours. The cost of working is found to be less than one penny per tun per mile; this includes engine, fuel, and attendance, and all establishment charges. The low figure at which the prime cost comes out is highly favorable to the success of the undertaking in a commercial point of view.

"The machinery by which the transit of trains is effected was designed and constructed by Messrs. James Watt & Co.; it is placed in the rear of the Holborn Station, and consists of an engine having a pair of 24-inch cylinders, 20-inch stroke. A fan 22 feet in diameter is geared at two to one with the engine, and is worked continuously, the alternate action of pressure and exhaustion being governed by valves; 100 revolutions of the fan will give 3½-inch water pressure; 200 revolutions give 13 inch. Pressures of 3¾ lbs., and even 1 lb. are quite within reach. In ordinary the fan works at 160 revolutions, equal to 6 ounces on the square inch. The machinery at Holborn is arranged for working both sections of the line, so that when the construction of the section from Holborn to the General Post-office is completed, trains will be drawn, by exhaustion, from that point and from Euston Square to Holborn simultaneously. Arrived there they will be placed each in the tube the other has just quitted, and will then be sent by pressure to their respective destinations, constant communication, if necessary, being thus maintained between Euston and St. Martin's-le-Grand. The works on the Post-office line have at present only reached as far as Ely Place, Holborn, but they are being vigorously pushed on. It is, of course, well known that the pneumatic line is constructed solely for the transmission of parcels and mail bags; nevertheless, a worse method of transit might be devised for passengers.

"The only inconvenience experienced was at the commencement and termination of the journeys, especially at the latter, when a sensation is felt in the ears very similar to that which occurs on descending in a diving bell. The time occupied in the return journey from Euston to Holborn was just eight minutes, which was rather in excess of the time taken by the train when laden with ballast only. But, in addition to the ten tuns gross load to be moved, there was now the weight of some eight or ten passengers, who thus practically illustrated their confidence in the efficiency of the system."