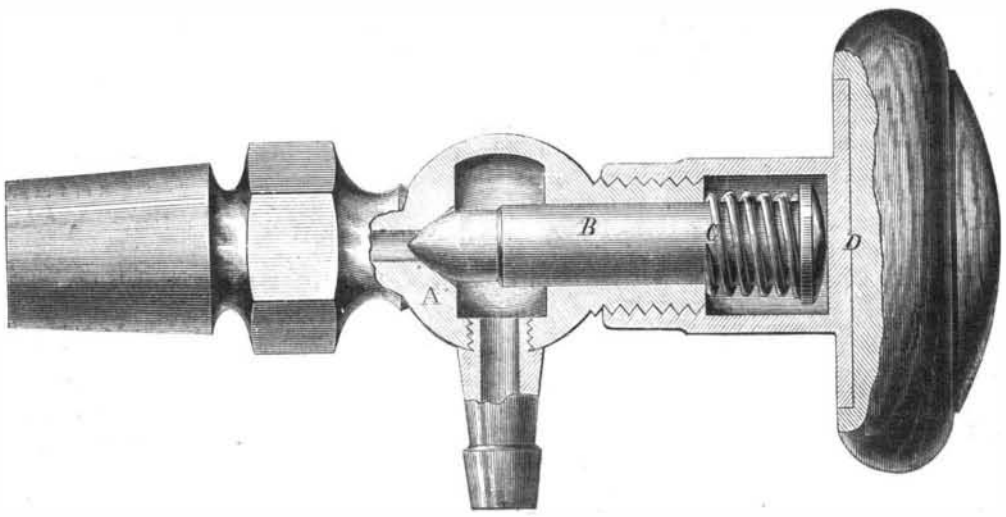
Improved Gage Cock.

It is a great annoyance and loss to have gage cocks continually leaking steam and water, or sputtering and fizzing so that one can hardly hear himself speak in their vicinity. Many gage cocks are so poorly made that, even if tight when first put in, they soon wear leaky and cause the annoyances before mentioned.

The gage cock here shown is designed to obviate these troubles, and be not only efficient, but much more durable.

In the engraving, A represents the chamber or shell of the cock, and B a valve therein. This valve is a plug, as may be seen, and has a very long bearing in the body itself, so that it is sure to work true to its seat. The valve is also larger at the head and has a spiral spring, C, fitted around the neck which bears against it and the body of the cock. The tendency of this is to force the valve off its seat and not depend on the steam or water pressure to effect the object. The head of this valve is rounded over on the exterior, and bears on a cap, D, so that by slacking off the same, the valve will be free to rise and open the passage leading from the boiler to the nozzle, and thus indicate the hight of water. By making the head of the valve rounded, a very small bearing is given on the cap; this causes the valve to remain stationary when in contact with its seat, while the cap alone rotates, thus preventing any uneven grinding of the valve on its seat and preserving it from injury. It will be seen that this gage cock gives a valve entirely independent and free of the handle, and admits of its being reground to its seat in a few minutes without the use of tools; and it is in other respects easily cleaned or got at for inspection when necessary.

It is durably constructed, and a patent is now pending through the Scientific American Patent Agency by John Broughton. Manufactured and for sale by Broughton & Moore, No. 41 Center street, New York.



BROUGHTON'S GAGE COCK.

ADMINISTRATION OF THE PATENT OFFICE.

COMMISSIONER OF PATENTS.—Thomas C. Theaker, of Ohio—Salary, $4,500.

EXAMINERS IN CHIEF.—S. H. Hodges, Vermont; E. Foote, New York; S. C. Fessenden, Maine—Salaries, $3,000 each.

EXAMINERS.—T. R. Peale, Pennsylvania; B. F. James, Illinois; Wm. Bebb, Tennessee; J. M. Blanchard, Indiana; L. J. Farwell, Wisconsin; A. M. Smith, New York; J. J. Halsted, New Jersey; T. C. Connelly, District of Columbia; Wm. B. Taylor, District of Columbia; C. G Page, District of Columbia; J. W. Jayne, Pennsylvania; B. S. Hedrick, North Carolina; W. C. Doane, New York; J. Brainerd, Ohio; N. Crawford, Illinois; J. T. Fales, Iowa—Salaries, $2,500 each.

CHIEF CLERK.—T. Harland, Connecticut—Salary, $2,500.

DISBURSING CLERK.—H. McCormick, District of Columbia—$1,800.

LIBRARIAN.—G. C. Shaeffer, District of Columbia—Salary, $1,800.

AN ENGLISH TANK ENGINE.

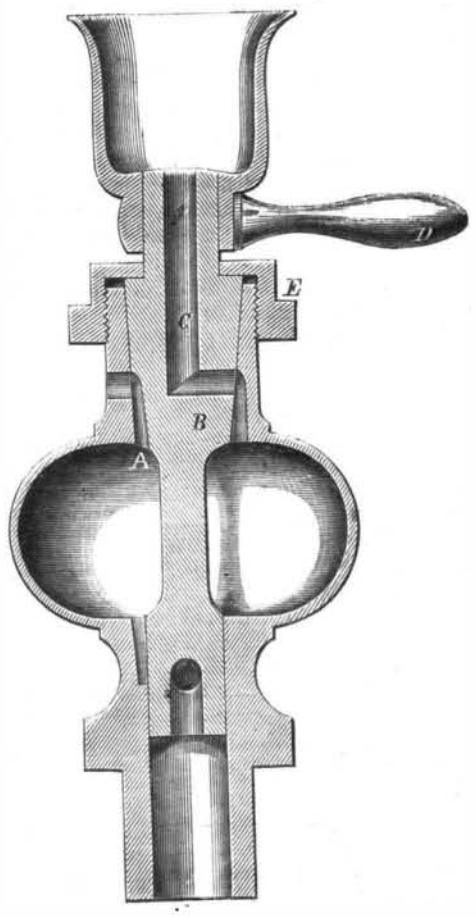
A new locomotive of a peculiar pattern has recently been constructed in England. It is a tank engine, without a tender, and is designed to haul heavy trains up grades. According to the *Engineer*, it is a cumbrous, ugly-looking machine, as our readers will surmise from the following details.

The firebox occupies the center of the engine, and there are, so to speak, two boilers, or rather, one boiler formed like two, set with the fireboxes touching each other. There are two funnels, one at each end of the machine, and two bogey trucks, with wheels 4 feet 6 inches diameter. The cylinders are four in number, 15 inches diameter, by 22 inch stroke, and the weight of the whole machine is 42 tuns. The firebox is 6 feet 6 inches long, by 3 feet 3 inches wide; and the boiler is 48 inches diameter, and has 198 brass tubes, 2 inches diameter and 9 feet long. The aggregate fire surface is 2,000 feet.

This engine was tried under adverse circumstances, being taken from the shop just as the workmen put it together, without any adjustment, and took a load of 300 tuns up an incline of 1 foot in 77 feet, the pressure being 100 pounds; and again, with the same load, it raised an incline of 1 in 85, but stuck nearly at the summit from the steam falling. When it rose a few pounds, the engine readily ascended to the top. It also easily ran round curves of 190 feet radii, and is accounted to be in general an improvement in engines of its class.

HARE'S OIL CUP.

The very many recent improvements on vessels or instruments for supplying oil to steam cylinders have



rendered them nearly perfect. In place of the old-fashioned globe cock, with its two faucets and troublesome arrangements, there are cups which, by pouring in oil and turning a handle, admit the lubricant to the engine. The cup here shown is simple in detail and very efficient. Many of the instruments alluded to are defective in the following respects: When the oil is admitted to the cylinder a quantity of steam rises and fills its place, so that when the communication is closed, this steam is shut up in the globe and blows the oil out, or burns the hand. Moreover, the globe being air-tight prevents the cup from filling properly. These difficul ties are avoided in the present invention by making a small channel, A, in the upper end of the plug, B, so that while the oil is poured in, as shown by the holes, C, the air or steam issues through the other aperture. On turning the handle, D, again, the up per holes are closed, and the lower one, E, opened, which allows the oil to enter the cylinder. This cup is provided with a stuffing box on top, so that the plug is always kept in its seat.

This invention was patented some time ago through the Scientific American Patent Agency, by James Hare, whom address for further information, at No. 155 Gold street, Brooklyn, N. Y.

A Large Yield of Whisky.

Mr. H. G. Dayton, of Maysville, Ky., recently produced from 30 bushels of corn and rye—two-thirds of the former and one-third of the latter—97 gallons of proof whisky, in his improved still, for which a patent was obtained through this office not long ago. This, we believe, is the largest yield from "double distilled copper whisky" ever produced from the same quantity of grain. It is conceded by all distillers and large dealers in whisky, that the greater the product from a given quantity of grain, the better is the product.

A Steam Car Upon Ice.

The Master Mechanic of the Peninsula Railroad of Wisconsin has in process of construction an ice car, which is expected to afford unusual facility for travel upon the frozen rivers in that region. An exchange gives the following description of the vehicle:

"It will be built like a commou passenger car; a pilot-house will be put at the forward end of the car, and immediately back of that will be two engines 6x12. Back of these will be a 10-feet boiler, 62 flues, and in the rear of that will be the passenger apartment. There will be four bob sleighs on which the car will rest—two at each end—with 15 feet space between the forward and rear bobs. In the center of the car will be a wheel, something similar to a cog-wheel, which will cut the ice and thus propel the machine. A wheel will be in the rear to steer it by some means we did not learn. They seem to be sanguine that they can make the thing work. It will require the ice, we should presume, to be quite smooth and even, to run this car, and although we hope they may make it work, yet we think we won't take passage on the first trip."

Mr. Norman Wiard constructed a similar car many years ago. In Russia, an English-built locomotive, weighing 12 tuns, ran regularly on the rivers, transporting goods and passengers. The cylinders were 10 inches diameter and 22 inches stroke. The drivers were 5 feet, shod with steel spurs. The general construction was the same as any other locomotive except that the forward truck was removed, and a sled placed underneath the boiler.—EDS.

The Philadelphia Photographer.

This is one of the most elegant and pleasing specimens of the typographic art ever issued, and it is as truly excellent in its contents as it is handsome in its appearance. It contains a large amount of original photographic information by the best writers upon the subject. Every number is also embellished with a fine photographic picture. The number for January contains a photograph done at night by means of the magnesium light. We see that the editor is laboring under the effects of bromide of potassium. He says it was a bitter pill. No doubt, as it seems to have been a full dose. Benerman & Wilson, Publishers, Philadelphia. $5 a year.

THE total area of the United States and its territories is 3,230,572 square miles.

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VOL. XIV., No. 4...[NEW SERIES.]..*Twenty-first Year.*

NEW YORK, SATURDAY, JANUARY 20, 1866.

Contents:

(Illustrations are indicated by an asterisk.)

Every man who has money to invest always desires to place it where it will make the best return. This being admitted, we undertake to say that $3, invested in the SCIENTIFIC AMERICAN, will return three-fold in the amount of valuable information which its columns supply. Mechanics, inventors, manufacturers, farmers—as well as every head of a family—will get, on an average, $10 worth of information from a year's number of this journal, and yet they can get it for the low sum of $2 50, in clubs of ten names.

Talk about high prices—here is something cheap enough to stop the mouths of all grumblers. Only think of it—a large volume of 832 pages, full of costly engravings, for $3, and less to clubs. It any of our readers think we can get rich at such prices, let them try the experiment. Send in your clubs and subscriptions.

CONCERNING BELTS.

In other parts of this paper our readers will find some thing of interest relating to belts. One is a communication from a Mr. W. Annan, of Illinois, on lacing, and the other an invention to facilitate the process. Certainly nothing can be of greater importance to manufacturers than belts, and all relating to them, for there is not a factory in the land, of any size, but has thousands of feet in daily use. Further, they are costly to replace, and careless or ignorant persons frequently destroy them by misuse.

Great remissness in lacing belts and laxity in the matter of inspecting them frequently, to see if they need repair, is noticeable. We have seen large machine shops stopped for hours while the main belt was being laced, and it is nothing uncommon for half or three-quarters of an hour to be wasted in stretching or putting in rivets, when the same ought to have been attended to over-night, or, at the least, during noon hour.

Manufacturers know very well that half an hour deducted from the labor of a machine amounts to a large sum, where there are many machines, and when these petty losses are easily avoided, there is certainly no excuse for their occurrence. Some man of experience should be paid extra to lace the belts whenever they need it. Let him make it his business to inspect them regularly, and be held accountable for their failure, if it appears that his neglect was the cause. This relates, of course, to the principal driving belts, for on the individual machines each workman ought to take care of his own.

The ends of a belt should always be cut off square, not guessed at by the eye, but laid off with a tool. The holes ought to be made with a small punch at a proper distance from the end—the size of the holes and the distances of them depending on the width of the belt. The use of an awl is reprehensible, for the holes are apt to be made irregular by it, and much larger than there is need of. The end of the lace should be tied with a square knot in the middle of the outside, for the corners of the belt where it is cut are most exposed and apt to whip out. Tieing a belt lace does not look so neatly as where the ends are put through an incision, but tieing saves the belt from having extra holes made in it. The laces ought to be of the same thickness from end to end, or as nearly so as possible. It often happens that laces have very thin spots in them; such should be kept for short belts, and never used for long ones. Moreover, the holes must be made at equal distances apart and not too many of them; every hole weakens the belt, and none that are not absolutely essential should be cut. All new laces, as well as new belts, should be stretched by hanging weights on them before they are used—petroleum, sawdust, resin, and similar substances should never be used. When a belt gets harsh or dry, neat's-foot oil is the best thing to apply to it.

A LARGE STEAM CYLINDER.

Not very long since, a steam cylinder six feet in diameter was regarded as something extraordinary, and many sagacious and experienced mechanics doubted whether any larger would ever be made. With years, however, came increased knowledge, and engineers were found bold enough to project engines with cylinders over 100 inches in diameter. Mr. Erastus W. Smith was the first engineer, in this country, to build large beam engines; the *Metropolis*, of the Fall River line, having an engine with a cylinder 105 inches in diameter, and twelve feet piston stroke. When this cylinder was cast at the Novelty Works, some six or eight years ago, it was considered an event. A horse and cart were driven through it lying on its side, and a collation was served in it to show its huge dimensions. After that many steam cylinders were cast of nearly the same size.

Recently Mr. Smith has designed some beam engines much larger than any now afloat. In point of piston area they are only surpassed by some screw engines in the British navy, which have cylinders 112 inches in diameter, and 48 inches piston stroke.

The engines alluded to are for a new steamboat company, formed to run vessels on the Sound between this city and Bristol, R. I., and the large cylinder belonging to one of the engines was successfully cast at the Etna Iron Works of Mr. John Roch, in this city. Its diameter internally is 110 inches by 12 feet piston stroke, and the weight is 18 tuns. The net length is 13 feet 8 inches, and the steam port is 60 inches by 12 inches. The walls of the cylinder are about $2\frac{1}{2}$ inches thick. The casting is one of the handsomest we have ever seen; it was superintended by Mr. William Gaynor, the foreman of the foundery.

The condenser for these engines is of the surface variety, and is a bulky affair, exceeding the cylinder in weight and dimensions. It is a rectangular body, 12 feet wide, 9 feet high and 18 feet long, and weighs 23 tuns. The average thickness of the walls is $1\frac{3}{4}$ inches. This would make a room much larger than an ordinary parlor, and far more commodious than the little 'dens called rooms in watering-place hotels. We shall give fuller and further details of these engines at an early day.

DEATH OF PROFESSOR MAPES.

Professor James J. Mapes died in this city on the 10th of the present month, in the 60th year of his age. Professor Mapes was born in New York and passed most of his life here, though for the last 17 years he had been cultivating a large farm with signal success in New Jersey. This farm was considered the model farm of the country, and was made so by the management of its owner; though a barren sand plain in 1848, it is said to have yielded recently a revenue of $20,000 per year.

Professor Mapes, like many Americans, tried various pursuits. In the course of his life he was in turn a trader, a sugar refiner, an editor, a farmer and a lecturer; and he made a number of valuable inventions. He was appointed Professor of Chemistry by the American Institute, and lectured on the science before that association. From want of early and systematic education, his statements were not always to be received without examination, but from the natural clearness of his intellect he had a faculty of stating what he did know that might well have excited the envy of many more learned men. With the single exception of Dr. Lardner, we never heard a speaker who was so lucid as Professor Mapes. In the useful labor of making science popular his ability was unsurpassed. He was a genial man, full of wit and humor, and through a very wide circle of acquaintances and friends his death will be sincerely mourned.

OUR POSITION ON THE EXPANSION QUESTION

We have many thousand new subscribers, and from communications received from some of them, we perceive that our remarks, in relation to the *Algonquin* and *Winooski* trial, have given the impression that we are advocates of Mr. Isherwood's theories, and that we do not believe in the economy of working steam expansively. Both of these notions are incorrect, as all our old subscribers and readers know.

We have repeatedly stated that we have no doubt of the economy of working steam expansively—that the most economical measure of expansion depends on the pressure of the steam, the extent to which it is superheated, the perfection with which the cylinder is jacketed, the velocity of the piston, and several other circumstances, including even the temperature of the atmosphere in which the engine is operated. In order to ascertain the most economical measure of expansion by experiment, we should want all the conditions to be as nearly alike as possible, except the point of cut-off. In the *Algonquin* and *Winooski* trial, one engine was run with 20 lbs. pressure and the other with 70, the steam in one being cut off at $\frac{13}{100}$ths of the stroke and in the other, at $\frac{62}{100}$ths. No human intelligence could ascertain whether any difference in the results would be due to the difference in the pressure or the difference in the expansion. A costly experiment conducted in this way seemed to us ridiculous.

On page 244, Vol. XI., we published an elaborate article on the theory of expansion, in which we expressed our dissent from the notion of Mr. Isherwood, that steam in expanding without doing work would be partly condensed. We stated that as the total heat of high-pressure steam is greater than that of low-pressure steam, expansion, where no work is done, should be accompanied by superheating.

In reply to this article Prof. W. J. Macquorn Rankine, of Glasgow University, sent us a communication in which he indorsed our position in opposition to that of Mr. Isherwood. As Prof. Rankine is the highest authority in the world in this department of physics, and as his statement of the law of expanding steam contains more matter in relation to the subject than was ever before expressed in the same number of words, we publish his communication for the benefit of our new subscribers.

TO THE EDITORS OF THE SCIENTIFIC AMERICAN:—

Gentlemen,—

As I see that in the SCIENTIFIC AMERICAN of the 15th of October, you make some reference to a work of mine, I beg leave to make the following remarks on the subject of your article.

The circumstances under which steam undergoes expansion may be classed under five heads:—I. When the steam expands without performing work. II. When it expands and performs work, the temperature being maintained constant by a supply of heat from without. III. When it expands and performs work, being supplied from without with just enough of heat to prevent any liquefaction of the steam, so that it is kept exactly at the saturation point. IV. When it expands and performs work in a non-conducting cylinder. V. When it expands