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VOL. XVII., No. 26....[NEW SERIES.]....*Twenty-first Year.*

NEW YORK, SATURDAY, DECEMBER 28, 1867.

Contents:

(Illustrated articles are marked with an asterisk.)

THE LAST NUMBER OF VOLUME XVII.

We give in this number a full index of the volume of which this is the last issue. No doubt this will be more satisfactory to our readers—those at least who preserve their numbers for binding, and probably most do—than publishing the index in a separate sheet. The list of claims in this number will be found to be unusually full, a gratifying evidence that dullness of business does not cripple the resources nor abate the industry of our inventors. With a parting word of good will to our present subscribers and a welcome to those who begin with our new volume, we wish for all a HAPPY NEW YEAR.

COMMENCEMENT OF A NEW VOLUME.

With the next number the SCIENTIFIC AMERICAN enters upon its twenty-third year. Probably no publication extant will furnish a more complete and exhaustive exhibit of the progress of science and the arts in this country for the past twenty-two years than a complete file of the SCIENTIFIC AMERICAN. It is a curious and interesting pastime to compare the condition of the mechanic arts as presented in some of our first volumes with that shown in our more recent ones. During all this time, nearly a quarter of a century, our journal has endeavored to represent the actual condition of our scientific and mechanical progress and to record the discoveries and improvements in these departments wherever made. The result is a compendium of valuable information unattainable through any other means.

But the SCIENTIFIC AMERICAN has aimed not only to gratify a laudable curiosity by collecting and presenting such information, but to give practical knowledge which could be applied to valuable uses.

We labor for the producers—the mechanics, farmers, laborers—those who build up a country and make the wilderness to blossom like the rose. We believe that the workers are the power, especially in this country; and while we do not wish to detract from the value of the products of merely intellectual speculators, we still think that the world needs specially the laborer. We use the term "laborer" in this connection in its widest sense, comprehending he who uses brain as well as he who employs muscle; scientific investigation and discovery should be followed by and united to practical application.

The improvement exhibited in our past volumes will be no less noticeable hereafter. Keeping pace with the "march of mind" we shall endeavor always to lead rather than to follow. The different departments of our paper are managed by those who are practically acquainted with the subjects they profess to elucidate. "To err is human," but we shall spare no pains nor expense to make the SCIENTIFIC AMERICAN as reliable in its statements as it is interesting in the variety and matter of its subjects. There are none of our people, from the student or professional man to the day laborer, but will find something in every number, of present or future value to him in his business.

A CHANGE AT THE PATENT OFFICE.

T. C. Theaker has resigned as Commissioner of Patents A number of gentlemen are mentioned as candidates for the succession, prominent among whom are B. F. James and Charles Mason. Mr. James has acted in the capacity of primary Examiner in the Engineering Class for a number of years, and has filled his position acceptably. Judge Mason held the Commissionership from 1853 to 1857, and his whole administration was marked with reform and ability. Judge Mason was educated at West Point, and he is a man of sterling integrity, a sound jurist, experienced in patent law, and a splendid executive officer. One thing may be relied upon, if Judge Mason should receive and accept the appointment of Commissioner, inventors will not have to complain long of delay in the examination of their cases. The Judge is as industrious by nature as he is stern and systematic by education and he will have no drones about him. The work of the office under his administration would be brought up and kept up.

A good day for inventors and all persons having business with the Patent Office will dawn when Judge Mason takes the Commissioner's chair again, and we hope the proper influences may be brought to bear to secure his acceptance.

OBITUARY.

EBENEZER WINSHIP, died at his home in this city Dec. 6, 1867, at the age of 67. A long and eminently useful although unobtrusive life entitles his memory to respect. He commenced his career as a mechanic in the steam engine establishment of James P. Allaire, soon after the application of steam for the propulsion of boats and long before its application to ships for the purposes of commerce or war. For fifty-two years, with the exception of one or two brief intervals, he was connected with the Allaire works in this city, and for more than forty years he was the master mechanic and general superintendent of the works. Probably no man now living has had a more intimate connection with the construction of the marine steam engine in all its remarkable changes and improvements, or been so long employed at one engine establishment.

James P. Allaire, the founder of the Allaire Works, died May 20, 1858, at the age of 73. He was an intimate acquaintance of Fulton and from the engine of Fulton's first boat, the *Clermont*, took drawings which he used in the construction of his first marine engines. He built the engines for the *Chancellor Livingston* which ran between New York and Albany. He built also the first marine engines ever constructed in this country, which were put into the steamship *Savannah*, the first steamer that crossed the Atlantic, and also those for the *Pacific* and *Baltic* of the Collins line, which ships surpassed in speed any before constructed.

Under such tutelage and with such advantages Mr. Winship rose successively through the grades of apprentice, journeyman, boss, and foreman, to the position of master mechanic and superintendent. Connected intimately with the progress of marine engineering for over half a century, he was the teacher of a large number of our engineers who now reflect credit upon their instructor. Mr. Winship's professional skill was unsurpassed; his ability in directing and managing others and thorough acquaintance with the minutest details made him invaluable in the position he so long honorably filled. His personal characteristics were faithfulness, industry, earnestness, kindness of heart, and unvarying punctuality and promptness. As master mechanic it was his invariable rule to be at the works an hour before the time for beginning labor to lay out the work for the hands, getting his breakfast in winter by gaslight and returning from dinner in time to see the condition of the work before the men arrived. In short, he made his employers' business his own and neglected nothing which might contribute to their success. He was a connecting link between the present generation of mechanics and that which saw the beginings of that great power, steam, which has revolutionized the world. His funeral on the 8th of December was attended by all the employés of the Allaire Works, by many from other mechanical establishments, and a large number of citizens.

How to Make Intelligent Workmen---Go and Do Likewise.

Mr. H O. Osborn, of Castleton, Vt., in a letter covering an order for a club of subscribers, says:—"It may not be uninteresting to you to learn that the last six names are those of young men in my employ. I have myself been your subscriber for the past four years, and knowing as I did the value of your paper, I felt it a duty I owed to my men to recommend the paper to their notice, and the result is as above. I am proud to think that I have so many in my mill who can appreciate its worth. I hope at no remote date to send you another list of names from among my own men, and I am certain that if every manufacturer would consult his own best interest he would do all he could to place your paper in the hands of his workmen, for I feel it to be a valuable acquisition to all in any way connected with machines."

We believe that employers who wish to improve the condition of their employés can render them no better service than to make each of them a Christmas present of a year's subscription to this paper. Send in the names early, so that we may know how large an edition to print to supply the demand. We close this Volume with over 30,000—nearly 35,000—subscribers, and we wish to commence the new with at least 50,000. Send in your names.

The Iron-Clads at Sea.

In his last annual report to Congress, the Secretary of the Navy thus refers to the cruise of the *Miantonomah* to Europe and her return and of the *Monadnock* to San Francisco, voyages the most remarkable ever undertaken by turreted iron-clad vessels. These vessels encountered every variety of weather, and under all circumstances proved themselves to be staunch, reliable sea-going ships. The monitor type of vessel has been constructed primarily for harbor defence, and it was not contemplated that they would do more than move from port to port on our own coast. These voyages demonstrate their ability to go to any part of the world, and it is believed by experienced naval officers that with slight modifications above the water line, in no way interfering with their efficiency in action, they will safely make the longest and most difficult voyages without convoy.

Steam, turreted iron-clads and fifteen-inch guns have revolutionized naval warfare, and foreign governments, becoming sensible of this great change, are slowly but surely coming to the conclusion that turreted vessels and heavy ordnance are essential parts of an efficient fighting navy.

THE SCIENTIFIC AMERICAN AS A MEDIUM OF BUSINESS.

We seldom publish the favorable opinions expressed by our correspondents when in their letters they allude to this journal. If we chose we could fill columns with notices similar to those which follow.

R. S. Miller of Logansport, Ind., under date of Dec. 2d, says:—

I have a club of 10 or 12 engaged, and will send names and money about the 20th inst. I have been reading the SCIENTIFIC AMERICAN for several years and frequently I find items in it of more value than the year's subscription. In No. 9, present volume, you illustrated a plan for setting steam boilers. I was much pleased with it and showed it to a friend of mine who was about re-setting a 60-horse power boiler in his machine shop. He adopted the plan. Four week's use of the improved furnace proves all you claimed for it. My friend will be one of your new subscribers. I shall, in a few days, re-set my 15-horse power boiler according to the plan. Every live mechanic should take your valuable journal.

The Lamb Knitting Machine Manufacturing Co, Chicopee Falls, Mass., say:—

In payment of your bill please find inclosed draft, etc. Please insert our advertisement every other week hereafter. We are compelled to this being overrun with orders. Unless they hold up we shall be obliged to withdraw it entirely. So much for the advantages of your medium for advertising.

C. W. Le Count, Manufacturer of lathe dogs and steam engine governors, South Norwalk, Conn., writes concerning his advertisement in these columns:

What business I have I can trace three-quarters of it directly to your journal.

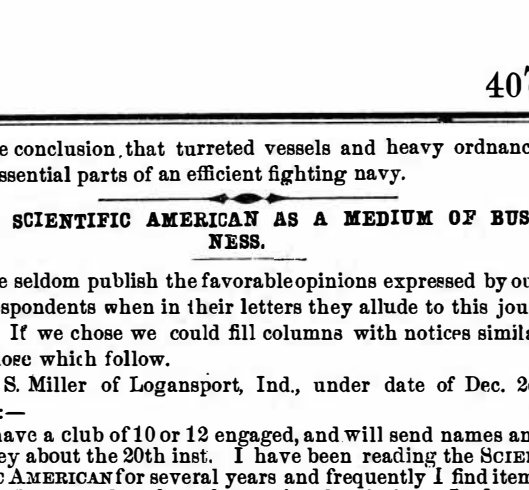
An agent of the Hinkley Knitting Machine Co., whose invention was illustrated in these columns some weeks ago, writes:

It is now but ten days since its publication, yet without a single advertisement in any paper I have been obliged to engage extra assistance to simply inclose my circulars to parties, who are writing and even *telegraphing* for agencies and machines, while many have traveled long distances to personally engage agencies. The Superintendent of the Company makes similar *complaints*.

HUNT'S IMPROVED STEAM PACKING PISTON.

Engineers are aware that there are more or less objections to the use of the ordinary spring pistons, owing to the changing tension of the springs, the necessity of frequent adjustment, and the impossibility of the packing rings adapting

Fig. 1



themselves to the varying pressures of the steam on the piston. A number of attempts have been made to produce a self packing or steam expanding piston, which will act always with the pressure of the steam and the velocity of the engine. The advantages of such a piston will be readily appreciated by practical engineers, especially drivers of locomotives, working, as they nearly all do, at a very high pressure of steam. The general complaint against the several packings in use on our railroads is, that they "pack too tight," and rapidly wear out the rings, while the only remedy has

Fig. 2

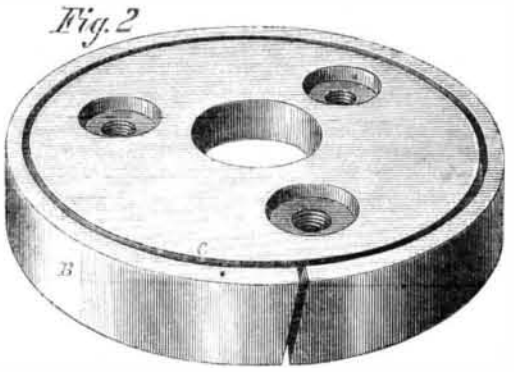
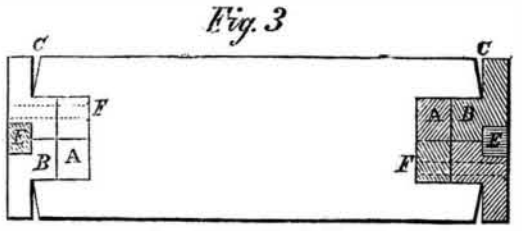


Fig. 3



been, the extremely uncertain one of contracting the openings by which steam is admitted under the ring, or rings, to expand them. The obvious objection to such an arrangement is, that it allows the steam to act on the rings with its full force during slow motion, as when a train is starting, while if effective under any circumstances, it will be so only at comparatively high piston speed. The efficacy of such a remedy, if it possesses any, is in fact inversely as the piston speed.

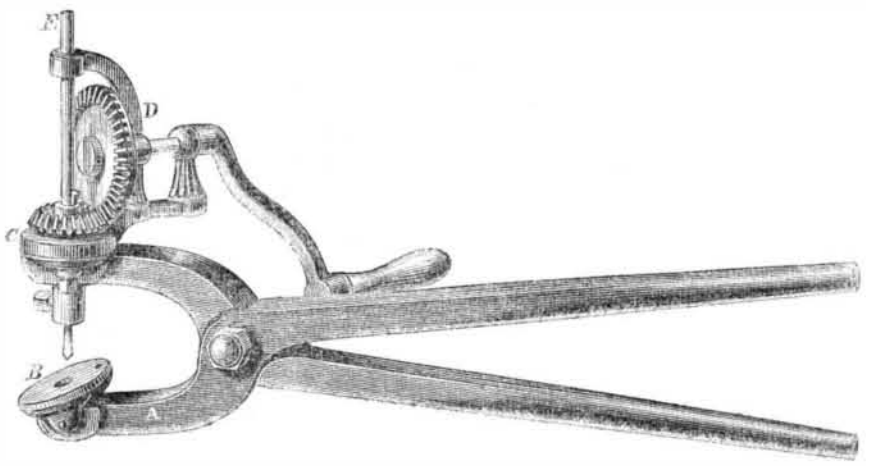
Fig. 1 is a perspective of the piston itself, or the "spider," with its follower and its rings removed, which are shown in Fig. 2. Fig. 3 is a cross section of another form of the piston, to be presently described, but which will serve to explain that shown in Figs. 1 and 2. Next to the core of the spider are two narrow internal rings, A, in Figs. 1 and 3; surrounding these two outer rings, B, the cross section of which is of L-form, as seen in Fig. 3. The lips of these outer rings extend to the whole thickness of the piston. The flange head of the piston, and also the follower, are turned beveling on their edges to admit the steam around the annular space thus formed under the rings, B. These spaces are plainly exhibited at C, in Figs. 2 and 3. Both inner and outer rings are adjusted to the bore of the cylinder by means of the gibs, D, and set screws seen in Fig. 1.

The section, Fig. 3, represents a modification intended for use in vertical cylinders, if considered necessary. The additional center ring, E, is intended to prevent leakage through the cut in the expanded ring and over the face of the unexpanded one, which might occur when the rings and cylinder should become so worn that the rings, when not expanded, should collapse and leave the surface of the cylinder. The rivets, F, shown by the dotted lines, are placed near the cuts in the L-rings, and are intended to hold the outside and inside rings together at that point, and prevent any tendency on the part of the latter to collapse and let steam under that part of the L-rings. Probably, however, if the packing is properly constructed and adjusted in the first instance, these devices will be unnecessary. In horizontal cylinders the weight of the piston, if properly supported on the set screws and gibs, will accomplish these objects, if the cuts in the L-rings are placed near the bottom side of the cylinder. The steam enters the annular space between the beveled edges of the spider flange and follower and the inner periphery of the overhanging part of the L-rings, and acts only on that part.

Patented by Nathan Hunt, Sept. 17, 1867. For further information address the patentee, or Sharps, Davis & Bonsall, Salem, Ohio, who will furnish piston heads to order on receipt of size of cylinder and piston rod.

Improvement in Hand Drills.

There are frequent occasions in a machine shop where light drilling is required on work it is inconvenient to bring to the lathe. For this the Scotch or ratchet drill, if the job is heavy, is employed, and if light, the breast drill. The placing and working of the former consumes considerable time, and the labor of drilling with the breast drill is excessive and exhausting. It is difficult also to hold the instrument so steady as not to cramp and break the drill. The combination of the drill with tongs and a pivoted bed piece, as seen in the engraving, obviates these objections.



NEVERGOLD & STACKHOUSE'S TONGS DRILL.

To the lower jaw, A, of a pair of tongs is pivoted a platen or bed, B, having a hole through its center, which is continued through the jaw for the passage of the drillings. The upper jaw is formed with a circular flange on which is mounted the circular or disk-like base, C, of the drill frame, D. This, with the frame, is secured on the jaw of the tongs by means of two screw bolts—one seen in the engraving—passing through the jaw and screwing into the base of the drill. These bolts pass through semi-circular or segmental slots, by which the drill frame can be swung around at different angles to the tongs, to adapt itself to the convenience of the workman and the requirements of the work. If desired, the crank by which the drill is driven may be used on the upright spindle, E. It will be seen that the pivoted base or bed, B, will allow the work to adapt itself always to the line of the drill.

In operation, the work being placed between the drill and platen, the left hand presses the handles of the tongs together, while the right turns the crank; the feed is thus graduated wholly by the pressure of the hand. No further description is required for understanding the construction or operation of this tool. Patented by F. Nevergold and George Stackhouse, June 19, 1866. Applications for the whole right, or for territorial rights, should be addressed to the latter at Pittsburgh, Pa.

Commissioner of Agriculture.—The Senate on Friday, the 29th ult., confirmed the nomination of the Hon. Horace Capron as Commissioner of Agriculture to fill the position made vacant by the death of Isaac Newton, the former head of the Department.

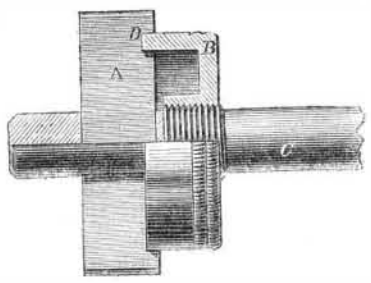
It is estimated that 10,000,000 feet of sawed lumber is frozen up in the docks at Bangor, Maine, three fourths of which is sold and waiting shipment.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Improved Method of Securing Cutters on Boring Bars.

Messrs. Editors:—Thinking it may be of use to some of the readers of your invaluable paper, I have taken the liberty of sending you a sketch of a new mode of securing the cutter in a boring bar or pin drill. Where the cutters are secured, as usual, by a key, all mechanics know that it is very difficult to set a cutter twice alike; and the notch, which is filed in the cutter, to prevent it from moving endways, is a great source of weakness, often causing the cutters to crack in hardening, as well as after they are put to work. The inclosed sketch will explain itself:



A is a cutter, and B a collar, screwed upon the cutter bar, C. The edge of this collar fits into a notch on either end of the cutter, as shown at D, thus leaving the cutter as strong as possible at the center, and giving it a solid support at the point where support is needed, and at the same time insuring its always coming alike.

Brooklyn, N. Y. Theodore L. Webster.

[The device seems to be eminently well calculated for the support of the cutter on a boring bar, and is applicable, with but slight modification, to a pin or "teat" drill. Machinists will readily perceive its operation and excellencies.—Eds.

Tides and Their Causes.

The phenomenon of the daily tides of our seacoasts and tidal rivers is attributed to the attraction of the moon upon the earth—that the moon draws the earth towards it, and that in drawing the earth towards it, it bulges up the water of the ocean on the side presented towards the moon, and drawing the earth and water thus on that side, also draws the earth *away* from the water on the opposite side of it, and thus leaves the water bulged up on *that* side, and in doing all this the effect comes after the cause some three hours, which is termed "the tide lagging behind." Now if we knew, *per se*, what attraction of gravitation was, and that it produced this anomaly of force, there would be nothing to question in the matter. But as we only know by attraction that it means *drawing to*, it is impossible to reconcile the theory of the tides as they run to the attraction of the moon. If the moon is so potent in drawing up, why does it not draw a bulge on the inland seas—our great lakes? I will not discuss the question of the moon's Apogee and Perigee—its different velocities in different pasts of its orbit, as laid down by the law of Kepler, or whether it turns once on its axis in a month, or not, as either theory will answer for its phases, as well as for the face of the "Man in the Moon," but I will endeavor to give a more rational theory for the phenomenon of the daily tides.

The earth revolves on its axis and makes a revolution every twenty-four hours, and this moves its equatorial surface nearly a thousand miles per hour. Now the water on its surface, covering about three-fourths of it, and being more mobile than the solid earth, is, by centrifugal force, made to roll around the earth, the same as the water is made to move around the grindstone when in motion, a thing familiar to every body that uses that instrument. In the Southern Ocean this motion of the water is so well known to mariners who double Cape Horn in sailing from San Francisco to New York, that they now run considerably lower down in order to ride this tide eastward, than they did in former times. Here then we have one fact of water tide more comprehensive, at least, than the tractive theory of the moon. We have also the fact of two great promontories in Capes Horn and Good Hope, where this great tidal wave must strike against, and they produce constant oscillations of the water to and fro, and produce gurgitation and regurgitation in all the gulfs and rivers that line the coasts of the Northern, or more properly, the Land Hemisphere. These gurgitations swell the water highest in the places where the seas become the narrowest, as the more northern latitudes. In addition to these daily oscillations of the water, there are constant eddy currents, denominated "Gulf Streams," all agreeing in their courses and motion to this theory of the ocean tides.

When our present received tide theory of moon attraction was first laid down, the fact of the water of the great Southern ocean rolling round faster than the solid parts of our planets was not known. Smith, in his Physical Geography, says, "The tidal wave flows from east to west, owing to the earth's daily rotation in a contrary direction." Here he is unintentionally correct, because the water striking these promontories of the two great capes, is hurled back, and not, as he assumes, that the great ocean wave is moving from east to west. The United States government sailing charts lay down the fact of this great ocean wave moving from west to east, south of the capes, and the ships coming from the Pacific to the Atlantic ocean take advantage of this, and ride the sea at the rate of over twenty knots per hour, by following the routes laid down in Maury's charts.

The old philosophy of the crystalline spheres was not more at variance with the correct motion of the stars and planets, than the moon theory of the tides. In their dilemma to account for the retrograde motions of the planets, they denominated them wanderers, straggiers, because they would not march with the "music of the spheres." In the moon theory of the tides the lunar satellite is made to pull and push at one and the same time, which is entirely at variance with the philosophy of force.

There is nothing in the heavens, nor in the earth, that proves to us positively that the sun holds the planets, and the planets their satellites, by attraction, as we are taught that the moon attracts the water of our world. We see that all terrestrial bodies tend toward the center of the earth, and we call this gravitation; but we cannot see how a body moves around the earth without falling on it, by this law. We say in dynamic philosophy, that bodies move in the direction of least resistance, and *that* we can positively understand; but what force *per se* is, we do not know. It is always better for us to explain phenomena by positive known laws and motions, than by any that rest merely upon conjecture.

Lancaster, Pa. Jno. Wise.

The Great Hoosac Tunnel.

Messrs. Editors:—In No. 23, Vol. XVII., of your paper, is an article upon the Hoosac Tunnel, but made up from data nearly a year old, and consequently not correctly representing the tunnel as it is at the present time. Your conclusions of course were based upon the same data; but during the past year, and especially during the past five months, much greater progress has been made than ever before upon the work, and a knowledge of what has been done since the last report was issued will, I think, give you a different impression of the time required for its final completion.

Referring to the profile in that number of the Scientific American, the following are the distances to the various points where the work is being prosecuted:

Distance from	east end to central shaft	12,837.294	feet.
"	central shaft to west shaft	9,747.072	"
"	west shaft to new shaft	265.000	"
"	new shaft to well No. 4	659.150	"
"	well No. 4 to pier*	1,522.825	"
"	east end to pier*	25,031.341	"

* The instrument pier is 4 feet west of the present west end of the tunnel.

The following are the lengths of the headings at the various points of the work, Dec. 2, 1867:

Length of	east end heading	4,608.000	feet.
"	west shaft, east heading	1,252.000	"
"	" " west heading	611.000	"
"	west end heading	617.000	"
Total length of headings		7,088.000	"
Leaving,		17,933.341	"

or 3,396 miles of heading yet to be made, of which 1,218.975 feet are between the west end and the west shaft, and 16,714.366 feet between the west shaft and east end of the tunnel.

The central shaft is down 583 feet, and well No. 4 is down 150 feet.

The progress for the month of November, 1867, was as follows:

East end heading	126.00	feet.
West shaft, east heading	33.00	"
" " west heading	5.00	"
West end	20.00	"
Total for the month of November	184.00	"

Thirty feet of brick arch were completed during the month at the west end, making a total of 516 feet of brick arch completed to date.

The progress for the last six months has been as follows:

East end	711.00	feet.
West shaft, east heading	216.00	"
" " west "	353.00	"
West end	150.00	"
Total, from June 1, to Dec. 2	1,395.00	"
" for the previous six months	632.00	"
" " year ending Dec. 2, 1867	2,027.00	"

The new shaft has been sunk, and at its foot are the pumps which, together with those at the west shaft, are now throwing out between 900 and 1,000 gallons of water per minute.

During the last month great quantities of water were struck at both headings of the west shaft (70 gallons per minute at the east heading in one day), and the work was stopped in consequence, which accounts for the small progress at this point. A new pump of 1,000 gallons per minute capacity will be at work, in addition to the above, in a few days, and the work can then go forward with increased rapidity.

Well No. 4 is an artesian well, which is now being carried down as a shaft to afford two more faces to work from. Its depth will be, when finished, 215 feet, its dimensions 8 by 8 feet.

At the rate of progress for the past year it will require but eight years and ten months to pierce through the mountain.