regular contacted spiral coils or layers of yarn firmly together.

Mr. Floyd Heavener, of Laramie City, Wyoming Ter., has made certain improvements upon the Car Coupling for which letters patent were granted the same inventor August 28, 1877, the design being to secure greater strength and reduce the wear upon the operating parts.

OUR IRON INDUSTRY.

With no less surprise than interest we note the prominent remedies which in various countries are proposed for restoring the vitality of the iron industry.

While here the two political parties are urging in Congress, the one an increase, and the other a decrease of tariff—each party deriving its opposing arguments and support from the iron manufacturers themselves, the English and French manufacturers are almost unanimous in favor of protective duties, and the government of Belgium has appointed a commission to inquire into the best means of enlarging the field for the consumption of iron, so as to increase the demand for the products of the Belgian works.

Evidently none of these measures would afford more than local and temporary relief; the trouble lies deeper, we think, and is to be reached and remedied only by discovering and adopting new methods and economies in manufacture.

Prominent among the many methods that have been presented to the iron manufacturers in the past ten years are two which with great cost and long experiment have been so far developed that but little apparently remains to be done to perfect them sufficiently for general adoption.

The manufacture of wrought iron directly from the ore—the direct process—and the application of pulverized coal to puddling and heating furnaces, are the two improvements we speak of.

The ideas are old and familiar, but their present improved methods of expression are of recent date, and have had but little publicity, especially among manufacturers on this side of the water.

Though, doubtless, quite as many new points in regard to these processes have been determined here as in England, we are able to obtain from the Reports of the Associations of the English Iron Manufacturers fuller knowledge of the progress made there.

And we would here remark that in these associations, at whose meetings every new process or improvement is fully examined, discussed, and criticised, our English cousins possess great advantages over us. While they act together for their mutual benefit, we act independently of or in opposition to each other, because of jealousies of competitive and sectional interests.

Without dwelling on the worth of Clay, Chênot, and scores of others who have successively added to our knowledge of the manufacture of wrought iron directly from the ore, we come to one of the latest experimenters on the subject—Siemens—who has recently obtained results indicative of a very near approach to a practical and economical solution of the problem through intelligent recognition of the necessity for fine pulverization and ultimate mixtures of the ore and reagents.

In our judgment the failure to recognize the importance of these factors has been the chief cause of the non-success that has accompanied the labors of most experimenters in this direction, for we have long held the opinion that unvarying and satisfactory products and proper economies in time and fuel could in no other way be attained; as only by fine pulverization of the furnace charge can the intimate mixture requisite to prompt and effective chemical reactions be secured.

The only things seemingly now required for the perfection of this process are a furnace of less cost and a manner of firing more simple than that of Siemens, for in the matters of economies in fuel, ore, and reagents, and in character of product, but little remains to be desired.

In the application of pulverized coal to the puddling and heating of iron, Crampton in England, at Woolwich and elsewhere, has achieved fair success by using the Danks revolving furnace; and the most intelligent criticism seems to establish the fact that the method would be completely successful, not only with the revolving but with all other heating and puddling furnaces, were the coal economically reduced to a finer powder.

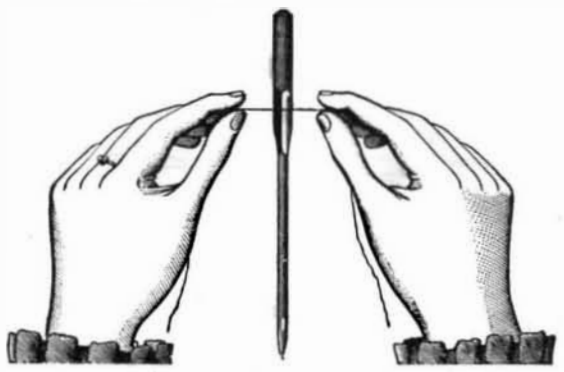
It would therefore appear that the cost of the revolving furnace and auxiliary machinery, and his imperfect yet expensive method of pulverizing, are the only obstacles which retard the general acceptance of Mr. Crampton's process.

Great progress, too, in these directions has been made with us in the past few years, especially toward the point arrived at by Mr. Crampton, so that, judging from the reports from the United States Armory at Springfield, Mass., where a pulverized fuel process has been in operation for several years, but little if any more experiment is required for its perfection. The furnace and the appliances for comminuting and injecting the coal are reported as simple, inexpensive, and durable, and as leaving but little more to be desired.

These two methods, then, which have been of very gradual growth, would seem to offer the iron manufacturer a way out of existing troubles. The manufacturers of iron *per se* must make cheaper and better iron if they would enlarge the field for its consumption, or even if they would hold their own against the steel manufacturers. They must seek new methods of manufacturing rather than changes in tariffs

COMBINATION NEEDLE AND THREAD CUTTER.

The annexed engraving represents a handy little arrangement, which every lady who uses a sewing machine will readily appreciate. It consists simply in forming on the shank of the sewing machine needle a knife edge, by which the thread is divided when pressed against it. Scissors are apt to be mislaid and time lost in searching for them, but with this device, so long as the machine is used, the thread



cutter is constantly at hand. The cutter is of the same fine steel, and receives the fine temper of the needle itself, so that it will retain its edge over an indefinite period. For further particulars address the Domestic Needle Works Company, Middleborough, Mass.

Cotton.

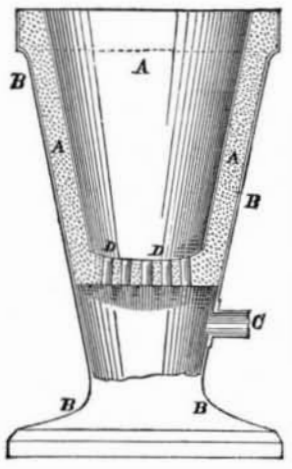
In 1860 the United States took 227,000,000 yards of British cotton goods. In 1877 we took only 61,000,000 yards. In the year first mentioned, Great Britain used half the whole cotton crop of the world; last year she used only 3,017,000 bales, against 8,959,000 bales used elsewhere. English manufacturers explain the relative falling off by the increase of capital elsewhere, and the ability of other nations to cope with them in power of organization; and add that the race will be to the frugal, the industrious, and enduring. They might well have added also the honest; for the credit of English makers has been sadly lowered in the East, and American competition favored, by the excessive adulteration of English goods, aggravated by short measure.

Risky Mining.

Speaking of the terrible explosion at the Haydock colliery, and the appalling frequency of such disasters in British mines, the *Tribune* remarks that these great slaughters do not prove that the skillful inventions and ingenious systems devised to reduce the danger of coal mining are worthless; they indicate rather that for every step of invention there has been a parallel step in taking greater risk. Mines that could not have been worked at all before are now filled with busy laborers, and the chances for loss of life have been little reduced. The frequency of such accidents is a disgrace to the supervision of mining which the British Government undertakes.

A SIMPLE FURNACE.

Mr. M. A. Beck, of Waterloo, Iowa, sends us the annexed sketch of a simple little furnace, well suited for brazing, hardening, and tempering small taps, dies, drills, etc. A is an ordinary flower pot, having a number of small holes, D, drilled in the bottom. B is a frame or casing made of sheet metal, and C is a blast pipe, to be connected with a small blower. The plan might be still further cheapened by setting the flower pot bodily into another one of smaller size, the space between the bottoms then forming the chamber into which the blast is conducted, without materially affecting the result.



Strength of Solar Heat.

Sir John Herschel ("Familiar Lectures on Scientific Subjects," page 64) says: "I have seen the thermometer four inches deep in the sand in South Africa rise to 159° Fah., and have cooked a beefsteak and boiled eggs hard by simple exposure to the sun in a box covered with a frame of window glass and placed in another box so covered."

HONOR TO AMERICAN SCIENCE.—The Huyghens medal of the Society of Sciences, at Haarlem, Holland, a medal awarded once in twenty years to the astronomer who has, during that time, contributed most to science by his discoveries and investigations, has been unanimously given to Professor Simon Newcomb, of Washington, the Superintendent of the Nautical Almanac.

To prevent the hair falling out, the common application, in Oriental countries, is the bruised bulbs of the *Asphodelus bulbosus*, garlic, or onions, mixed with gunpowder. An infusion of the small leaves of the orange or lemon tree in red wine, containing 20 grains of tannin per liter, has also proved serviceable.

Communications.

The Microphone.

To the Editor of the Scientific American:

In *Nature* of May 16th is an article upon the above subject, in which it appears Professor Huxley presented to the Royal Society the microphone as an invention of Professor Hughes, of Kentucky. The device used on that occasion was a glass tube about 2 inches long, fitted with pencils of carbon, through which the battery current was transmitted. Professor Huxley on speaking to this was enabled to transmit words to an ordinary Bell telephone. If Professor Huxley had placed ordinary lead shot in the tube, about number 12, he could have received as well as transmitted by pressing the neck of a common glass funnel to the tube and applying the ear to the cone. We have repeatedly received through such an arrangement, and also by a device arranged on the principle of the Trevelyan rocker; that is to say, we have received without a diaphragm or electro-magnet. As to the wonderful discovery accredited to Professor Hughes, we can only say that we see no need whatever of supposing that "we are beginning to tap sources and modes of energy hitherto undreamed of," nor that the discoveries furnish "a new method of attaching and quantifying molecular motions." Nor is Mr. Edison justified in supposing that he has discovered new and important properties in carbon, for all his results, as well as those of Professor Hughes, can be explained by old and well known causes, which are present in all the experiments published. We have been engaged in investigations on this subject in the same direction as Professor Hughes for the past half year. Many of our experiments are identical with his, and give the same general results. While we agree with him as to facts, we cannot, however, accept his conclusions, nor those of Mr. Edison. All our own experiments, as well as those published by Professor Hughes and Mr. Edison, when closely examined, support us in our conclusion that the effects produced must be ascribed to the well known facts of *contact resistance* at the surfaces of contact between the different parts of a non-continuous conductor. This was in fact the point of departure for all our investigations, and all our experiments were especially arranged so as to determine whether or not this cause is sufficient to produce the required effect (transmission of articulate speech). We succeed not only in transmitting articulate speech where nothing but contact resistance could have been the cause, but also in receiving with some of our contact transmitters, as indicated above. We are still engaged in experiments to determine the conditions under which a conductor containing surfaces of contact can act as telephonic receiver. Now, as contact resistance can be proved to be sufficient to produce all the effects obtained by Professor Hughes and Mr. Edison, and as this element is certainly present in all their experiments so far published, the true and simple logic of science compels us to reject their conclusions until they have obtained the same results after having completely eliminated that element from their experiments. At a future day we expect to give to the public a detailed account of the experiments which have led us to our conclusions.

W. H. PITT,
W. H. DOPP.

Central School Laboratory, Buffalo, June 11, 1878.

The Antiquity of Civilization.—A Query for Professor Newcomb.

To the Editor of the Scientific American:

Under the heading "Planetary Population," in your number for June 1st, 1878, page 346, Professor Newcomb is reported as saying, "The latter (the earth) has probably been revolving in its orbit 10,000,000 years; man has probably existed on it less than 10,000 years; civilization less than 4,000 years." As a student of archæology and anthropology, I would like to ask Professor Newcomb, who being a scientist of some eminence in his line is supposed to know what he is talking about, how and where he obtained the data for these most astonishing figures—especially the two latter (although I imagine paleontologists and geologists would be equally anxious concerning the first).

Under these estimates of time what becomes of the discoveries of Lepsius, Mariette, and others in Egypt, where they declare they have unearthed structures, monuments, tombs, statues, etc., dating back 4,500 to 5,000 years before our era? The deciphering of hieroglyphics, which has attained a high degree of certainty, shows us that nearly, if not quite, 7,000 years have passed since the Fourth King of the First Dynasty built the Pyramid of Cochomé, the first that greets the traveler toward the desert on leaving Cairo. Three thousand years before Solomon built his temple to the "most high" God on Mount Moriah, or the Assyrian reared his altars to Baal on the platform of Koujunjik, Egypt was an old country, her architecture grand and imposing in style and perfect in execution, her language not only fully formed, but reduced to writing, her statuary natural, and her paintings vivid in coloring and truthful in design. I have before me on the table a *fac simile* of the hieroglyphs on the "Gliddon Mummy Case," in the National Museum (*Smithsonian Contributions to Knowledge*, No. 208). Egyptologists are agreed that this case and the writings on it date back to a period antecedent to the reign of Sesorthus or Tosorthus, who flourished B.C. 3,240 to 3,211. Who will look at the exquisite drawing and coloring of this ancient piece of work and be willing to admit that the scribe who executed it was not civilized? nay, that he lived 1,000 years before civilization existed upon earth? And this was already in the fifth dynasty

Who will look upon the temples and tombs of Memphis and of Thebes, dating 2,000 years still further back, or 5,000 years before our era, and say that the people who built them were not "civilized?" Even the orthodox Bunsen, upon study of them, abandoned the, till then, implicitly received Mosaic or biblical chronology, and was compelled to relegate the genesis of man back to 20,000 years B.C. ("Aegyptens Stelle," Bd. V., Th. V., pp. 342, 359.) How many thousand years Egypt must have taken to arrive at the stage of civilization in which Mariette, Lepsius, Renan, and Bunsen show her to have been seven thousand years ago, we have no means of knowing.

I would also ask what is to be done with the fossil man of Denyse, of Mentone, of the Neanderthal and other locales; of the remains of man found commingled with those of the cave bear, the woolly rhinoceros, and other extinct mammalia of the diluvium, and so commingled as to leave no room to doubt their cotemporaneousness? What explanation can be made of the discoveries of Wokey Hole, Kent's Cavern, the Cavern of Aurignac, the Trou de Frontal, and the numerous other bone caves of France and Belgium; of all the labors of Schmerling, Sprung, Baer, Vogt, Boucher de Perthes, Lartet, l'abbé Bourgeois, Lyell, and Lubbock?

Were Professor Newcomb less eminent as a man of science, or had his opinions appeared in some journal less prominent as an educator than the SCIENTIFIC AMERICAN, I should hardly take the trouble to call attention to them; but coming whence and through the medium that they do, they are well calculated to do harm by conveying false impressions to the many hundreds of readers who look to your journal solely for accurate information on all scientific topics.

Respectfully,

FRANK L. JAMES, Ph.D., M.D.

Osceola, Ark.

A New Flying Machine.

The first open air exhibition of Professor C. F. Ritchell's flying machine was conducted at Hartford, Conn., on Wednesday afternoon, June 12. It went up to a height of fully two hundred and fifty feet, past the spire of the Colt Memorial Church, and sailed off until over the Connecticut river, the operator meanwhile exhibiting his power to change its altitude and direction at will. When he ascended there was but little wind blowing, and the machine appeared to be under perfect control; but gradually a breeze sprang up, and it was deemed safest to make a speedy return, as there were indications in the sky of a gathering storm. The machine turned and made its way back in the teeth of the wind until directly over the ball ground whence it had ascended, and then alighted within a few feet of the point from which it had started.

From this demonstration of its capacity it was generally conceived that it could do much more than its modest inventor claimed for it. He never expected it to move against a wind of any strength, and has not had the attainment of that end in view in its construction, as may readily be seen by a glance at its proportions, but he does claim that it can be raised or lowered at will to leave adverse currents and enter favorable ones; that it can be made to tack so as to effect a little headway even against a breeze, and that in a still atmosphere it can be moved about as readily and perfectly at the will of the operator as a boat can be moved upon quiet water. All that, and even a little more, there is abundant evidence of its having done on Wednesday.

The inventor, Mr. Ritchell, is a Maine man, but has during several years past lived at Corry, Pa. The project of constructing a flying machine has been a favorite subject for contemplation with him during nearly ten years past, and for the last seven of that time he and his friend, Mr. W. H. Lyman, of Corry, Pa., have incubated his idea together. In November, 1876, they went to Bridgeport, Conn., to put their plans into execution, as they believed they could there obtain most readily just the peculiar materials they required, and have them put together in the most perfect manner. Their confidence in Yankee resources and skill was not misplaced, but their crude ideas were not immediately crystallized into a perfect machine, nevertheless.

In the first apparatus which they constructed, some parts were too heavy, others too large, and there was an ineffective application of power. Then a second one was built, that now upon exhibition, and though it cannot be said to be so far perfected as to be capable of application to practical service, such as serving a mail route, or even as a popular vehicle for travel, it is still of very great importance as proving the correctness of the theories upon which it was based. Mr. Ritchell took it to the Permanent Exhibition at Philadelphia, May 10, 1877, and so succeeded in effectually concealing it from public knowledge for a long time. Now he has put it into the proper course for either securing its development or making it a worthy pioneer for other inventors in this branch of science.

The flying machine is all clumsiness above, all lightness and grace below. The lifting power is afforded by a horizontally placed cylinder of "gossamer cloth," fine linen coated with India rubber, twenty-five feet in length and thirteen in diameter, weighing only sixty-six pounds, and charged with hydrogen gas, which is made by the usual process from iron turnings and sulphuric acid. Broad worsted bands extend over that and down to a rod of mandrel drawn brass tubing, nickel plated, 1½ inch in diameter and 23 feet long. From that rod the machine is suspended by slender cords. The after portion of the machine is at the base a parallelogram of rods 2 feet wide and 5½ feet long, from which rise, lengthwise, curved rods 18 inches high in the center, and drawn near together at the top. All these rods are in reality hollow tubes of mandrel drawn brass, light and very strong. Above the apex of this form rises a cog edged steel wheel, 11 inches in diameter, with double handles so geared to a four bladed fan moving horizontally directly beneath, that the operator can give the fan 2,000 revolutions per minute. The four blades of the fan are of white holly, each having a superficial area of about 50 square inches, and the extreme diameter of this revolving fan is 24 inches.

The blades are set at a slight angle, like those of a screw of a propeller. Just behind the wheel is a very small seat, upon which the operator perches. His feet rest upon two light treadles above and in front of the fan. From the front of this form spring other rods, carrying at their extremity a vertically working revolving fan, like that beneath the operator's seat, except that it is but 22 inches in diameter. It is so geared to the main or horizontal fan that it may be operated or not, at the pleasure of the driver of the machine, and can be made to turn from one side to the other, so as to deflect the course of the machine in the air. This fan will make 2,800 revolutions per minute when the other is making 2,000. All its movements are controlled by the operator's feet. When he presses the left treadle he throws it into gear, when he presses with the toe of his right foot it turns to the left, and a slight pressure of his heel whirls it over to the right. He can also reverse the action of his main fan, so that when it whirls one way he goes down, and when its course is reversed he mounts in the air.

That this is not merely a claim, has been clearly demonstrated. Then the weight of the operator and machine and the lifting power of the gas cylinder have been so nicely adjusted that they were exactly balanced; six pounds have been added to the weight of the machine, and the working of the horizontal fan has caused the apparatus to rise and continue to ascend as long as the lifting power of the machinery was exerted. The weight, normally, of the machine, and the rod from which it is suspended, is 48 pounds. This, then, gives 114 pounds as the weight of the entire apparatus. The operator, Mark Quinlan, who went up on Wednesday and again yesterday, weighs 96 pounds, and to balance him and the dead weight against the lifting power of the gas, he had to carry along with him about nine pounds of shot and stones.

The second exhibition was given June 13. The weather was far from favorable. The wind came in quite sharp gusts, and there were threatenings of a coming storm. Nevertheless, the ascent was made. Little Quinlan, even if he does only weigh ninety-six pounds, has confidence and nerve enough to go up in a gale. Some time was spent in getting the weight and lifting power so neatly balanced as to show that the machine could exert a lifting power of its own. When this had been effected to Professor Ritchell's satisfaction, the apparatus rested quietly on the grass, but could be lifted or set back with the light pressure of one finger. Then the word was given to "Go." Quinlan began turning the wheel, the horizontal fan revolved with a noise like a buzz saw, and the machine darted up almost vertically to a height of about two hundred feet. There a strong, steady current of wind setting toward the southwest was encountered, and the machine was swept away by it, broadside on to the spectators. Then the operator was seen throwing his vertical fan into gear, and by its aid the aerial ship turned around, pointing its head in whatever direction he chose to give it. All this was the work of but a few seconds. Although Quinlan could move the apparatus about, he could not make any headway against the strong wind. Reversing the motion of his horizontal fan, he descended apparently about one hundred feet, to get out of the current, but, finding that impracticable, reascended to a much greater height than he had first reached. Still he was swept off toward New Haven, and after a little time went out of sight. He had vanished behind a distant hill, and for a while it was supposed he had alighted. Then he was again sighted, far away and not less than one thousand feet above the earth. The cylinder of the machine looked no larger than an orange. At length he disappeared altogether.

At 6¼ o'clock P.M., having been up battling with the wind very nearly an hour, he descended safely at Newington, and at 10 o'clock was back in Hartford. He said that at one time he was eight or ten miles away from his starting point, but by tacking and working between the gusts of wind, won his way back as far as Newington, only five miles from Hartford. He says that the working of the machine is so easy that he could continue it for four consecutive hours, without fatigue, in a quiet atmosphere.

Mr. Lord, the Superintendent of the Colt Arms Factory, has watched the experiments with much interest, and his opinion as a practical scientist is of value. He says that while he does not see an immediately practical use in this flying machine, he cannot but regard it as a great step in progress, one which should be recognized as of immense importance and encouragement for hope of speedy good results in the way of aerial travel.—*New York Sun.*

The Musical Phonograph.

Professor Johnson lately exhibited in this city a new instrument supplied by Mr. Edison, which reproduced Levy's "Last Rose of Summer," the "Carnival of Venice," etc. Every ear was on the alert to listen to the performance of the phonograph. Levy came in front of the mysterious thing, and blew a blast on his bugle horn strong enough, as it would seem, to blow the whole concern out of existence, and when he subsided Professor Johnson reversed the crank, affixed a sort of horn to a disk on the cylinder, and out came all of Levy's music, with all his variations, to the last note The wonderment and delight of the audience were great in the extreme, and they applauded the articulating phonograph as if it were a living and breathing thing. When Miss Cole sang to it "Comin' thro' the Rye," there was intense curiosity to hear how it would be returned, as her voice has a birdlike quality in the upper register that it was thought impossible for the phonograph to counterfeit. When Professor Johnson turned the crank Miss Cole herself sat petrified in astonishment as she heard her very trills imitated by the insensible piece of machinery before her. Of course the song of the phonograph was nothing to that of Miss Cole, because the voice was metallic and without the attributes of flesh and blood, but its close rendition of the words and accent was really marvelous to hear.—*New York Herald.*

NOTES FROM THE PARIS EXHIBITION.

Mr. Patrick Adie, Broadway Works, Westminster, London, shows in operation the Fraser type-setting and distributing machines. In the composing machine there are long lines of vertical type discharging at the end into vertical gutters converging to a point below; a keyboard causes any required letter to be advanced from its line and to slide down its gutter into the common destination at the bottom—the "stick" or "galley." Thus a long line, or a number of short lines, may be rapidly set up; but there is the great disadvantage that except for figure work, poetry, or similar "takes," the lines must be justified by hand. The distributing machine, which is the reverse of the composer, seems but little improvement over handwork. A speed of 10,000 types (not ems) per hour is claimed; but we should hardly feel inclined to admit such speed, at any rate for more than a short run, and with a "fat take" and practiced hands.

Messrs. Gwynne & Co. show a line of centrifugal pumps for wrecking purposes, etc., and some centrifugal gas exhausters. In the former we note the abandonment of the foot valve and the addition of a small air pump of the reciprocating type, to take its place. There is a pendent self-oiling tube from the center of the shaft, performing the same office as that employed in the "Buckeye" engine, and of somewhat the same construction. The slide valve eccentric on the gas exhauster is shiftable, and an index pointing to abscissas scribed on its plane face indicates very neatly the amount of alteration.

Thomas Winans.

Mr. Thomas Winans, eldest son of Ross Winans, the well known inventor of the modern railway coach, recently died at Newport, R. I. Mr. Winans served his apprenticeship in his father's shops, and at twenty years of age he went to St. Petersburg, Russia, with a locomotive engine of his father's manufacture and pattern, to compete for the equipping of the then new Nicolai railroad. He was fortunate enough to secure the contract, and this led to his undertaking other public works in Russia, which proved so lucrative that in 1850 he returned to the United States with a fortune of ten million dollars.

It is said that he spent a fifth of this vast sum in making experiments, mainly of a mechanical nature, for his own amusement. He designed and built a cigar shaped vessel, by which he undertook to revolutionize modern notions of marine architecture; at the outbreak of the war, he devised a gun in which bullets were to be projected by steam instead of by gunpowder. He also attempted a new method of ventilation, for which he erected many curious structures, including a huge chimney some 100 feet high. His last efforts were directed toward the fitting up of large organs, to be operated by steam and hydraulic pressure. Mr. Winans died at the age of 58 years.

RAILWAY MILEAGE.—The Cleveland, Columbus, Cincinnati, and Indianapolis railway claims the most remarkable locomotive mileage on record, one of its engines having run 44,526 miles in nine months, or at the rate of 72,000 miles a year. This is more than double the average of the best roads. The engines of the Union Pacific averaged 34,248 miles last year. The record of five engines of the New York Central and Hudson River road shows that their average yearly mileage for seven consecutive years was 46,776 miles, at an average cost for repairs of 2·44 cents a mile; one engine running over 323,100 miles at an average of 1·87 cent for repairs.

A GREAT LOG DRIVE.—Over a thousand choppers were engaged along the Upper Connecticut last winter, and the largest log drift ever driven on that stream has just been got safely home. The drift was started early in April in charge of 250 trained drivers from Maine, New Hampshire, and Quebec, and high water enabled the crews to complete the work in an unusually short time. Of the forty millions constituting the drive, ten millions stopped at McIndoe's Falls, Vt., ten millions to Southern Massachusetts, and the remainder to Hartford.

ALABAMA CORUNDUM.—A correspondent writes us that large quantities of corundum, for emery wheels, are shipped from Tallapoosa county, Ala., to Massachusetts.