

ERASTUS BRIGHAM BIGELOW.

In the death of Erastus B. Bigelow, America loses another of the great inventors whose genius has so largely helped to raise her industrial prosperity to its present high position. Thirty-five years ago all carpets were woven on hand looms. The cost of labor in this country made it impossible for American carpet makers to compete in cheapness with the work turned out by the ill-paid hands of England and France; and even then, the high price of carpets made them rather an article of luxury than one of everyday use and convenience. In 1842 Mr. Bigelow, after making several useful though less important inventions, perfected a series of devices for making the carpet loom automatic, so that the costly labor of man might be displaced by the cheaper labor of women or boys.

After many unavailing efforts to induce carpet makers to undertake the manufacture by the new method, Mr. Bigelow succeeded in persuading the Lowell Manufacturing Company to make the experiment, and in 1845 the successful weaving of ingrain carpets by power was demonstrated. Subsequently Mr. Bigelow achieved the invention of power looms for the weaving of Jacquard Brussels, and Wilton carpets. To apply these inventions the inventor was compelled, in 1848, to set up a factory of his own. This establishment, at Clinton, Massachusetts, has grown to be the largest in the world for the manufacture of Brussels and Wilton carpeting, in which the several processes of worsted spinning, dyeing, and weaving are united in one concern. We may also set it down to the credit of Mr. Bigelow's inventions largely that the United States now leads the world in carpet production.

Mr. Bigelow was born in West Boylston, Mass., April, 1814, and died at his home in Boston, Saturday, Dec. 6.

REMARKABLE FLY WHEEL EXPLOSION.

On the night of December 5, 1879, the Rensselaer Iron Mill, at Troy, N. Y., was the scene of a most remarkable accident. The newspaper report says:

"It was about 10 o'clock, and the 200 workmen were busily engaged at their various tasks. Suddenly the large flywheel, 35 feet in diameter, and weighing 60 tons, exploded, it being separated into 10 pieces of about 6 tons each. Each of these pieces was hurled for some distance, several of them being forced through the roof. One passed through the air about 200 feet, and descended through the roof of a neighboring mill. Striking upon the iron floor, it bounded for a distance of 30 feet, settling within three feet of a nest of two boilers. Several workmen were about passing when the ponderous fragment entered, and their escape from death was narrow. James Wallace, a heater, was buried beneath a five ton piece of the wheel, and when extricated was still alive. He cannot recover, however, his skull being fractured, and he having been injured internally. In places the roof was completely destroyed. The damage will not fall short of \$10,000. Work will be necessarily suspended for two weeks or more. The escape from a boiler explosion was exceedingly narrow, a piece of the bursted wheel, weighing six tons, falling between two of another nest of boilers, and destroying a portion of the brick work. Had the mass crashed through the boilers, the loss of life would have been large. Another fragment descended through the roof, breaking a steam pipe and burying itself through the floor at a spot where a workman had been standing not five seconds before. The wheel had been in use 11 years, often subjected to inspection, and the cause of its explosion is a mystery."

We trust that the causes of this extraordinary accident will be investigated by competent mechanical engineers, and the whole matter explained for the public benefit. We should be glad to receive full particulars with drawings for publication, if any of our friends can supply them.

A somewhat similar occurrence took place in this city in June, 1876, at the Kuntz Brewery, Third Avenue. In this case the fly wheel was only 9 feet in diameter, weight 3,600 lb. We gave at that time an extended report of the affair, with drawings, which showed beyond all question that the accident was due to carelessness and botching in the original fitting together of the wheel.

If there is any one part of a machine that requires more intelligence, skill, and minute care in its construction than another, it is the fly wheel. And after the wheel is put into use no other portion of an engine needs more frequent, careful inspection, and tapping, for the detection of flaws or the incipient loosening of parts, than the fly wheel. But we fear that both in the use and in the construction, carelessness is apt to be the rule and carefulness the exception.

THE SCIENTIFIC AMERICAN FOR 1880.

Like all the rest of American institutions, the SCIENTIFIC AMERICAN closes the year with the most assuring prospects of prosperity in the year to come. There never was a time when our patrons in the scientific and industrial world were more numerous or more successful in their undertakings, or had more solid grounds for looking back with satisfaction, or forward with confident expectation of increasing prosperity. The country has entered upon a period of successful activity which has made the past year profitable beyond precedent; and the coming years bid fair to surpass it in solid gains. Having taken possession of the vast and varied markets of our own land, our farmers, manufacturers, and merchants are reaching out to the earth's remotest ends, with every prospect of retaining and increasing their hold upon the world's most profitable trade.

From its intimate connection with all the great and growing material interests of the country the SCIENTIFIC AMERICAN cannot but share largely in the country's general prosperity; and the publishers are determined to make it more and more worthy of its position as the most popular scientific and industrial paper in the world. With a circulation of 50,000 copies every week, among the most intelligent and active men of the country, the men who are doing the country's best work and contributing most to its industrial and commercial activity, the SCIENTIFIC AMERICAN has a basis of permanent prosperity unrivaled among newspapers, and can offer to advertisers a medium for reaching customers unequalled in scope and directness. In addition, its monthly EXPORT EDITION, with a guaranteed circulation in all the principal cities and commercial centers in the world, is probably doing more to spread a knowledge of American productive industry throughout the world than all other periodicals combined. An examination of any issue of our EXPORT EDITION will show how widely its advantages as an advertising medium are appreciated by our great manufacturers and merchants engaged in foreign trade.

With reference to matters more strictly personal, it may not be improper to say that the increasing favor with which the SCIENTIFIC AMERICAN is received by intelligent readers at home and abroad is the surest guarantee that the work it is doing is approved by its numerous friends.

As its circulation increases the possibility of adding to the scope and value of the matter it offers from week to week increases proportionally; and it is the purpose of its publishers not to slacken their efforts to make the paper increasingly worthy of its name and reputation. One great advantage of its widening circulation is the wider range of information it receives with regard to scientific discoveries, trade prospects, and commercial changes, from its friends in all parts of the world; and just here we may properly express our thanks for such communication from United States consuls, travelers, the heads of foreign business houses, and others, who have thus added materially to the interest and value of our pages. It is enough, in the way of promise for the future, to say that the coming volume of the SCIENTIFIC AMERICAN will not be inferior to those of the past, and will be as much better as experience, increasing facilities, and strenuous effort can make it.

Among a number of valuable and interesting subjects in hand for early issues, we may mention an article fully illustrating the central office system of telephonic communication, which is becoming so important a factor in modern social and business life. The illustrated articles on amateur mechanics, which have been so favorably received during the past year, will be continued; so, also, will the valuable series describing and illustrating our great manufacturing industries, and a larger share of attention will be given to practical mechanics and improvements in the various arts and other productive industries.

The SCIENTIFIC SUPPLEMENT will, as heretofore, give, in addition to many valuable original papers on scientific and mechanical subjects, a careful selection of all the more important discussions in the various departments of science and art made in all parts of the world. As hitherto the SCIENTIFIC AMERICAN will publish every week a full table of the contents of the SUPPLEMENT, so that those who are not subscribers to both papers may learn whether the SUPPLEMENT contains matter which is of especial interest and value to them.

THE FUTURE OF AFRICA.

What the eighteenth and nineteenth centuries have done for America the twentieth is likely to do for Africa. Civilization is attacking her ancient fastnesses from all sides. Europe is especially alive to the enormous capacities of the continent for trade. A score of more or less powerful missionary societies are bent upon the evangelization of its swarming millions; and with the facilities for rapid progress furnished by steam and electricity the speedy conquest of the interior by Christianity and the arts of peace is all but assured. Unlike the Americas, when first discovered, Africa is well peopled by nations for the most part well advanced in civilization, and ready to become important factors in the industrial and commercial world. They are far enough advanced to be large producers of many things that the industrial world has need of, and are equally well calculated to become large consumers of industrial products.

What with telegraphs along the coast, steamers and railways pushing inward along its ancient lines of traffic, the suppression of its external slave trade, the pluck and energy of scientific, missionary, and commercial explorers, and the great wealth of the national and international societies bent upon the early evangelizing of the African peoples and the commercial development of the enormous natural capacity of the country, we may reasonably expect in the near future an awakening in Africa as marvelous as anything the world has yet witnessed. Dark as its present condition is, Africa is a land of splendid possibilities.

It is not surprising, therefore, that commerce is studying its newly opened regions with keen interest; or that the ecclesiastical world is showing the liveliest concern for the future of regions which promise to be the seats of great Christian nations.

For a comprehensive, exact, and trustworthy survey of the real condition of this vast continent, its physical and ethnological characteristics, the recent work of its numerous explorers, the prospects of the various missionary enterprises on foot there, and the most suitable places for new

undertakings, nothing could be more satisfactory than the paper read by the careful and learned recording secretary of the American Board of Christian Foreign Missions at the late meeting of the board of commissioners of the society at Syracuse. The paper is published in full in the current number of the SUPPLEMENT, in connection with an excellent map of Africa, embodying the results of all recent explorations.

STAMPS FOR TRADE MARKS.

In another column a correspondent proposes a method by which Congress might give protection to trade marks incidentally, under its power to levy and collect taxes.

Briefly stated, the plan is for the Bureau of Internal Revenue to make and issue to each manufacturer, who should want protection, a special stamp bearing his trade mark, as is now done in the case of patent medicines; these stamps to be sold nominally for revenue, but really for that protection to the manufacturer which might be provided under existing laws against the counterfeiting of revenue stamps. The tax thus levied would be uniform throughout the United States, thereby conforming to the requirements of the constitution; but the payment would be optional with those who desired its indirect protection.

The suggestion is a clever one, but open, we think, to several serious objections. The stamps would be expensive, even were the government to furnish them at cost. The labor of attaching them to each article to be protected would add another large item to the expensiveness of the proposed method. And still worse, it would be quite impossible to make the stamp permanent. The trade mark on a piece of chinaware, for example, would lose half its value if it could not be wrought into the material or imprinted upon its surface so as to stay. The same may be said of most lines of metal manufactures, woodenware, and so on. A stamp for revenue purposes, on the contrary, is intended to be quickly, surely, and easily destroyed. The existing system of State registration, imperfect as it is, would seem to be less troublesome, cheaper, and more efficient.

Henry Crawshaw.

Not six months ago we had occasion to notice the death of Robert Crawshaw, the great iron master of Merthyr Tydvil, Wales. About a year before, his brother, Francis Crawshaw, died; and now we have to note the death of Henry, the last remaining son of William Crawshaw, the great iron king of Cyfarthfa. A full account of the vast establishments built up by the elder Crawshaw and his sons was given in this paper last June. When he died he left the whole of his valuable property in the Forest of Dean to Henry Crawshaw, Cyfarthfa to Robert Crawshaw, and Treforest and Hirwain to Francis Crawshaw. From the time he came into possession of this property until the depression in the iron trade Henry Crawshaw continued to increase and improve his inheritance, the total amount of ore worked between 1860 and 1870 reaching nearly 400,000 tons. At the time of his death he was preparing to enter extensively into the tin plate trade. He was the nearest likeness to his father among the three sons, and had all his father's perseverance and intuitive power. He was rugged in manner, but generous hearted, and won the hearty reliance of all by his unswerving probity. He died November 24, aged seventy-six.

Long Range Telephoning.

In a recent issue of this paper an exchange was credited with the statement that Mr. Robert Packer, "superintendent of the Pennsylvania Railroad," while traveling in Nebraska had conversed with his wife and friends at his home in Sayre, Pa., two thousand miles distant, by means of a telephone.

We now learn on good authority that, though Mr. Packer's friends received his communication by telephone, it was not so sent by Mr. Packer. The message was sent from Nebraska to Mauch Chunk, Pa., by telegraph; thence it was telegraphed to the Sayre office of the Pennsylvania Canal and Railroad Company (of which Mr. Packer is superintendent), and from there it was transmitted to Mr. Packer's house by telephone—falling short of the newspaper report of the telephone's performance by some nineteen hundred and ninety-nine miles and a fraction.

Our Sons Need Good Reading.

"I wish that my son had more of a taste for useful reading and study." Such is the lament one often hears from anxious fathers. To interest their children in things that are beneficial, thus to save them from bad company and pernicious habits, is the constant aim of every faithful parent. One excellent means to this end consists in making the SCIENTIFIC AMERICAN a regular visitor at your dwelling. Let it be in sight on your bookcase or table, and notice how quickly it attracts the young. Its pages are full of the most interesting, varied, and useful information, the study of which insensibly excites the mind with a desire for more; and this desire, once fairly kindled, endures through life, expanding and ennobling the intellect. A new volume of the SCIENTIFIC AMERICAN commences next week. Fathers, subscribe for your sons if not for yourselves.

Recognition of American Merit.

In the Transactions of the Institute of Naval Architects, London, England, 1879, are the names of John A. Tobin, Engineer Corps, U. S. Navy, J. B. and N. G. Herreshoff, United States America, all of whom were elected members at the last meeting.

Mineral Oil and Electricity for Lighthouses.

The annual report of the Lighthouse Board says that the substitution of mineral oil as an illuminant has been made in many of the fourth, fifth, and sixth order lights. All of these orders of lights would have been supplied except for the fact that it is found that the oil deteriorated when placed in the ordinary large oil butts in use, and many small cans have had to be made, into which the supply of each station is placed. The great superiority of mineral oil as an illuminant over all other oils has induced the board to try the experiment of using it in the lightships. The oil used for this purpose is 300° of the flash test. It is thought that such oil, used in the Funck lamp, will much increase the usefulness of the lightships, and a great saving in the cost of oil will be made.

The board is desirous of making experiments to test the relative merits of the electric light and other illuminants. These experiments must be made in some lighthouse and on a sufficient scale to exhaust the subject. There are many machines for generating electricity, several of them of American invention, and the board wishes to test the principal ones. An appropriation of \$50,000 is asked for the purpose of making these experiments.

An appropriation of \$50,000 is asked for the construction of a first-class lightship, fitted with a powerful steam fog signal, to take the place of the lightship now off Sandy Hook, entrance to New York harbor. This is regarded as one of the most important light stations on our coast; and as an immense commerce flows past it, it should be marked by a vessel having all the modern improvements, to make it a more certain guide to the mariner. Should an appropriation be granted, the present lightship could be moved to a less important station.

The Earth's Day Increasing.

In a recent lecture on "Eclipse Problems," Professor Charles A. Young, of Princeton, said, with reference to the observed increase in the rapidity of the moon's motion, that the discovery led at first to the opinion that the moon's orbit was growing shorter, and that ultimately the moon would come down upon us. More accurate calculation, however, shows that there is no danger of so disastrous a result. The moon is not coming nearer, but our day is growing longer, owing to the friction of the tides upon the earth's surface. The tides act like a brake, and slowly diminish the speed of the earth's rotation.

THE DUPLEX AIR COMPRESSOR.

Although compressed air cannot, under ordinary circumstances, compete with steam as a motive power, the machinery necessary to its use has been perfected to such a degree that it has been extensively applied to mining, quarrying, and engineering purposes, and it seems to be the only available motive agent for such uses. Compressed air as a motive power has been the subject of a great deal of practical investigation and experiment, and the losses arising from increase of temperature by the compression of the air and the cooling by expansion, also losses due to the resistance of the valves, and dead spaces at the ends of the compression cylinders, have all been reduced, if not avoided altogether.

The annexed engraving represents the duplex air compressor manufactured by the National Drill and Compressor Company, of 76 and 78 Center street, New York city. This machine, though quite plain in appearance, is of unusual strength and efficiency. We are informed that the performance of this engine is fully equal to that of the best engines in market. The dimensions of the compressor are as follows: Length of bed, 12 feet 6 inches; height of center of cylinders from floor, 18 inches; diameter of steam and air cylinders, 10 inches; stroke of pistons, 18 inches; length of connecting rod, 52 inches; diameter of wheel, 5 feet 6 inches; number of revolutions per minute, 133; cubic feet of free air compressed per minute, 436; weight of machine, 11,400 lb.

Steam is admitted to the steam cylinders by a slide valve having an automatic cut-off. The air cylinders are lined with composition, and kept cool by water which passes spirally around the cylinder from the center toward the ends. By this arrangement the air cylinder is kept cool without having water in the cylinder. The air piston is adjustable, and travels to within one thirty-second of an inch of the cylinder heads. The induction and eduction valves are made so that they can be removed without disturbing other parts of the machine.

The National Drill and Compressor Company build single and duplex compressors of different sizes, which may be run by direct connection with steam engines, as in the engraving, and others which may be run by belts or gearing from the shafts of water wheels or other motors; they also make a variety of rock drills and mining machines which are in use and well known in all parts of this country, and are widely and favorably known in foreign countries.

A NEW TELEPHONE.

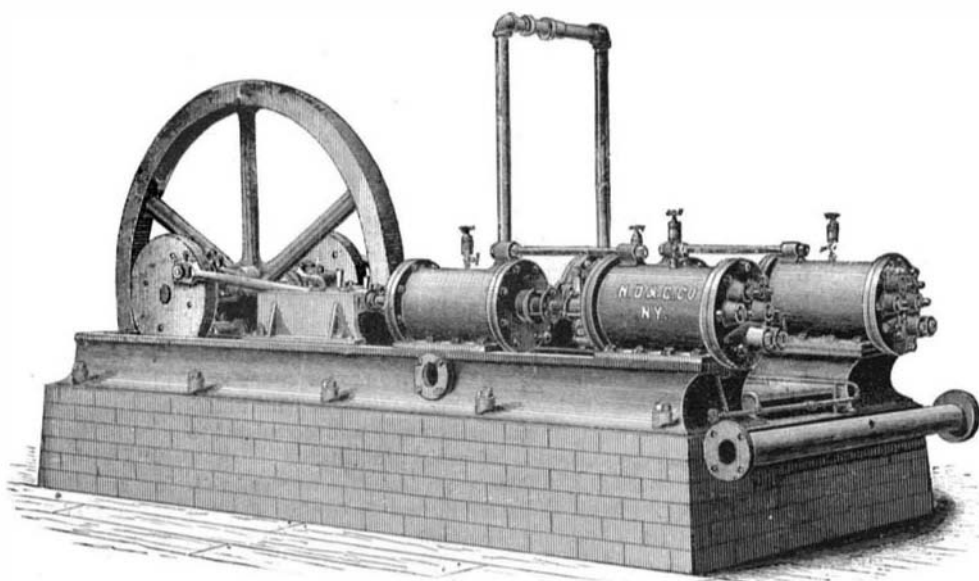
In the telephone shown in the annexed engraving the inventor has made use of Jamin laminated U-magnets to secure great magnetic power with little weight. The ends of the magnet are cut off diagonally, and the poles are each surrounded with a helix of fine insulated copper wire connected as in an electro-magnet. Two of these magnets are attached to an elliptical hoop, which surrounds the head and supports

**NOVEL TELEPHONE.**

the diaphragms and ear pieces. Each diaphragm carries a light triangular armature, which fits the poles of the magnets and nearly touches them. The telephones are connected with each other and with the line. The operation is similar to the Bell telephone. The instrument shown in the engraving is arranged as a receiver to be used with any of the ordinary transmitters, but it may be arranged as a transmitter.

Mr. Andrew C. Hubbard, of Danbury, Conn., is the inventor of this telephone.

A NOVEL system of insurance for girls has existed for several generations among the Danish nobility of Copenhagen. A nobleman, upon the birth of a daughter, enrolls her name with the insurance society, paying at the time a fee, and subsequently an annual sum, until she reaches twenty-one. She then becomes entitled to a fixed income from the society, and to apartments in the large building of the asso-

**DUPLEX AIR COMPRESSOR.**

ciation, which is surrounded by gardens and a park. Should her father die in her childhood, she may immediately occupy the apartments. Should she die or marry, the income and the right to entail the home both lapse.

MEN of science, students, inventors, and every other class of persons desirous of keeping up with the times should become regular subscribers to this paper. They will find it a paying investment, for the SCIENTIFIC AMERICAN not only contains a record of all the important discoveries and inventions of this country, Great Britain, and other English speaking countries, but translations from the French, German, and other foreign scientific and industrial publications.

MISCELLANEOUS INVENTIONS.

Mr. Judson S. Corbin, of Clinton, Iowa, has patented an improved gate, which is so constructed that it may be opened and closed by the wheels of passing carriages. It is simple, convenient, reliable, and not liable to be obstructed or get out of order.

An improved water closet cistern has been patented by Mr. Hugh Houston, of Pittsburg, Pa. The object of this invention is to provide an improvement in that class of automatic overflow cisterns for water closets, whose discharge is so regulated, by means of an overflow compartment or chamber and float and valve connected therewith, that the discharge occurs at regular intervals, and each time gives the water closet bowl a sudden flush and thoroughly washes it out.

An improvement in letter boxes has been patented by Messrs. Wauhope Lynn, of New York, and Gottfried Clasen, of Brooklyn, N. Y. It consists in providing the box with a tube extending from the slit at the top inward and downward, and closing the lower end with spring doors having arms in position to be operated upon by a plunger connected with the hinged door covering the slit at the top on the outside, whereby, when the outer door is opened to put a letter in the box, the doors at the end of the tube are closed, thus cutting off communication through the tube with the interior of the box; but when the letter is slipped through the slit and the outer door allowed to close, the inner doors open and permit the letter to fall within the box.

Mr. Theodore L. Wiswell, of Olathe, Kan., has patented a combined buckle and trace carrier, consisting of a metal skeleton buckle frame having hooks located opposite each other, and having their ends bent inward, then forward and downward, to adapt them for holding the cockeyes of the traces securely when the latter are not in use, and yet permitting convenient detachment of the cockeyes when required.

An improvement in grooving irons has been patented by Mr. John W. Ammons, of Columbia, Mo. The object of this invention is to provide a plane iron which will chamfer off the outer corners of the groove simultaneously with the planing of the groove. It consists in a plate with beveled cutting edges combined with a grooving iron.

An improved swinging gate that is to be placed across a railroad track to keep cattle and other animals off, has been patented by Messrs. David A. Walker and John R. Smith, of Fort Benton, Montana Ter. It is to be opened by the contact of the pilot or cow catcher of the locomotive, and will close automatically immediately after the passage of the train.

An improved combination tool, patented by Mr. Morgan H. Sly, of Shepardsville, Mich., combines several tools in one for the convenience of the mechanic, farmer, house-keeper, and others. It consists of a screwdriver, nail puller, wrench, nail hammer, wire cutter, riveting hammer, and pinchers combined in one tool.

An improved feed bag for horses, patented by Mr. Edwin Forbes, of Brooklyn, N. Y., has means for supporting feed bags in a convenient position for horses to eat from without interfering with the natural movements of the head. It consists in a spring arm adapted for connection upon the hames, with its outer end extending over the horse's head, and from which outer end the feed bag is suspended.

Mr. Patrick Gallagher, of Eureka, Nev., has patented an improved fire escape for attachment to buildings, which is so constructed that people can readily escape from the upper stories of burning buildings when the stairways may be rendered impassable by the fire.

Mr. Samuel H. Gregg, of Crawfordsville, Ind., has patented a fence panel formed of a long and short post, twisted wires, and hook headed bolts, arranged and applied in a novel way to form an inexpensive yet substantial fence.

An improvement in vises has been patented by Mr. Fortunato C. Zanetti, of Bryan, Texas. It consists in providing the clamping-jaws, which are secured to the lower end of the fixed jaws of the vise, with a spherical socket and adjusting-screw, to adapt the said jaws to embrace a ball on a standard attached to the bench, to form a ball-and-socket connection between the vise and bench.

Mr. Joseph Seiler, of Norwalk, Conn., has patented an improved device for connecting the mirror standards or supports with a bureau.

in such a way that they can be easily attached and detached.

Mr. Charles F. Harvey, of Van Buren, Ark., has invented an improved attachment for the dashboard of wagons, and other vehicles drawn by horses, for holding the reins. It consists of an adjustable frame attached to the dashboard, supporting a horizontal bar, composed of two parts, the upper part being divided so that the reins can be slipped down between the two parts.

Mr. Samuel V. Kennedy, of New Haven, Conn., has patented a device for removing the metallic primer from an exploded cartridge shell, for applying a new primer, and for closing the shell tightly about the ball after it has been reloaded.