with strong, sharp-pointed steel teeth, so adjusted as to work on the twist of yarn or thread waste—combing or teazeling out gradually, the twist holding the fiber of wool together, and forming it into a thread. This gradual removing of the twist by the combing or carding process, leaves the fibers of wood composing the thread waste long and strong, with nearly the original length of staple. This gentleman also exhibits an improved machine for cleaning fibrous materials, essentially the same patented by him in 1861.

Chapin & Downes, of Providence, R. I., exhibit a

DOUBLE-CYLINDER LONGITUDINAL GIG,

which, among other advantages that have caused its extensive adoption, is arranged to work on broad or narrow goods, gigging two narrow pieces in the same time, and with as much facility as one broad piece.

C. L. Goddard, of New York, exhibits a patent Steel Ring Burring Machine, attached to a wool-carding machine. A peculiar feature of this machine is the solid packing rings, which are whole, like the steel rings, and make the cylinder permanent and solid until worn out. The same gentleman exhibits a

MESTIZO WOOL-BURRING MACHINE,

which combs open the wool by a comparatively slow and harmless process, and removes the dust, Mestizo, and all other burs, or other extraneous matters, at the same time, oiling the wool.

H. W. Butterworth, of Philadelphia, Pa., exhibits a warp dryer, which, however, has not operated at any time we have been at the Fair as yet. It looks, however, like a good machine.

The Empire Heddle Works, of Stockport, N. Y., exhibit one of their patent heddle frames, which might, from the adroitness of its movements, be almost fancied to be alive. It forms the eye in a new manner, making the twist next the eye so tight that the finest warp of woolen, cotton, or silk can not enter. It gives any requisite shape or size to the eye, and sharp angles, at the ends, are avoided. Both the machine and the heddles it makes, elicit much favorable comment.

These are, we believe, all the machines on exhibition connected with textile manufacture, and our readers will doubtless agree with us, that the display is very meager. It certainly does not properly exhibit the progress made in the manufacture of such machinery in the United States.

There is a fine display of

MACHINISTS' TOOLS

in the machinery department, though it cannot be called a very extensive one. It, however, pretty fairly represents the present status of the manufacture in the country.

The machinery of this kind is placed in inclosures allotted to the various manufactures. Three prominent manufacturers are represented, and we will notice the displays of each separately.

Hewes & Phillips, of Newark, N. J., exhibit a Planer which will do work 2½ feet in width or hight, having nothing novel except the belt-shipping lever, by which lead is given to either one or the other of the belts at will. A saving in wear of belts is claimed for this arrangement, and ease in taking apart and putting together. The belt shippers are supplied with gibs which can be replaced when worn. This firm also exhibit a 12-inch upright boring press, evidently a good tool. The pattern is new. The head can be raised and lowered independently of the feed, which is automatic. It has a peculiar arrangement of back gear, the head is balanced, and there are other good features. They have, also, on exhibition, a 6-inch slotter, a very compact and powerful machine, and a 20-inch lathe, 12 feet long. All these machines are handsomely finished and their designs are good. A peculiarity of the machines made by this firm, is eccentric gearing on all the tools where a quick return is desired, by which they secure a quicker return than any other similar machines exhibited. They have, also, in their inclosure, an 84-inch gear cutter, which, though presenting, perhaps, no novel features, is worthy of remark for its general excellence.

Wm. Sellers & Co., of Philadelphia, Pa., exhibit a 16-inch lathe, 13 feet in length, with a very novel and interesting feature. The feed gear for ordinary turning is composed of friction wheels, so arranged that, by a lever, which the workman operates with the left hand (the right hand remaining free to operate the other parts of the lathe), the feed may be slackened or accelerated at will, without any alteration in the speed of the lathe. This feature will give increased facilities in certain kinds of work, and the device is generally admired by the many experienced mechanics who witness its operation. This lathe has also a system of back gear by which a perfectly positive motion is attainable when desired. Sellers & Co., also show a powerful 48-inch slotter, with compound table, a shaping machine, for small work, and a bolt cutter, all of which are well known to the mechanical world, and need no special comment from us, except that they fully sustain the enviable reputation of this firm. They also exhibit several sizes of the celebrated Giffard injector, with a model showing the internal construction of this paradoxical instrument. Also, a 25-inch planer, of a very simple construction, and, in every respect, praiseworthy.

The shafting which drives these machines is supplied with oil from Wickersham's American Oil Feeders, manufactured and exhibited by J. B. Wickersham, 143 Front st., Philadelphia, Pa., which have not only received the indorsement of Sellers & Co., but many other prominent mechanical engineers throughout the country.

Wood, Light & Co., of New York, exhibit a bolt cutter which has some novel and valuable features. This machine is so constructed that the dies close accurately to a certain point, so as to form, in effect, a single solid die. When the cutting is done, these dies open automatically, and the bolt is shot out. It cuts threads of any length, always true to the body of the bolt, and all the bolts made by the same dies will be exactly alike. All the movements of the machine are automatic, the attendant's duty being merely to keep the machine in order and supply the blanks as wanted. The same firm exhibit a shafting lathe which attracts much attention and elicits much favorable comment. This lathe employs three cutting tools, and finishes a shaft at a single operation. A longitudinal trough is made in the bed of the lathe, and in which a solution of soda is placed, this fluid being pumped up and poured constantly upon the shaft at the point of cutting. This lathe, and the bolt cutting machine exhibited by this firm, and the lathe exhibited by Wm. Sellers & Co., combine more novel features than anything else among the machinists' tools displayed.

Outside of these inclosures are scattered about a variety of machines and implements, some of which we shall notice in the present article. There are on exhibition a considerable variety of

DROP PRESSES, BLANKING PRESSES, PUNCHES, DROP HAMMERS, ETC.

Charles Merrill & Sons, of New York, exhibit an Air-spring Forge Hammer, and a Drop Hammer. The air-spring hammer runs with little noise, and, by a peculiar arrangement of the cylinder and piston, the hammer is driven by air springs, which saves the machine from jar, other than the blow on the anvil or work.

The cylinder and hammer moving in vertical slides, each blow is square, exactly in the same place, and some kinds of die work can be forged as exact as under a drop, with greater rapidity. It is under the perfect control of the operator, and can strike light or heavy, slow or fast, as desired.

The drop hammer is so constructed that the operator can raise and drop the weight from any hight in the slides, can stop the weight after it begins to fall, or can let it settle down slowly.

Parker Brothers, of West Meriden, Conn., exhibit one of their highly finished and excellent power presses, which are favorably known to the manufacturing public as the Fowler Presses—an excellent tool, as we know from experience.

Mays & Bliss, of Brooklyn, N.Y., exhibit a beautiful Double-action Power Press, very strong and compact, of easy adjustment, with the feed rollers so constructed as to carry off all scrap metal. It is claimed that this machine will cut and bur 60,000 blanks in ten hours.

The Farrell Foundery and Machine Co., of Waterbury and Ansonia, Conn., also exhibit a Double-acting Press, of very compact form, which cuts and draws sheet metals into cup-shape at one operation. This is an excellent machine and deserves special notice.

Post and Goddard, of New York, exhibit an improved Emery Grinder. This machine was described and illustrated on page 324, last volume, of the Scientific American, to which the reader is referred. It may be bolted to a bench, the frame stand consisting of a single casting, containing bronze boxes for the spindle. It has rests, which can be readily set on the side or face of the wheels, and removed when not wanted, the whole forming a neat and convenient arrangement. This firm also exhibit various sizes of their Tanite Emery Wheels in connection with the above machine.

The New York Tap and Die Co. exhibit a fine collection of taps and dies, and the American Standard Tool Co. show a case of beautiful Twist Drills, arranged on a revolving platform. These drills are so well and favorably known that they need no praise from us. Any mechanic, who examines them, will pronounce them excellent.

Nathan & Dreyfus, of New York, exhibit their patent Self-Oilers and Engine Cups, composed of a transparent glass cup, mounted in Britannia and brass, provided with a hollow tube, inside of which is placed a loose-acting solid wire, which acts as a feeder and regulator. The wire rests constantly upon the journal, thereby acting with the bearing in its motion. The wire is so regulated inside the tube as to feed according to the demand only. There is no flow of oil whatever while the machinery is not in motion.

Charles Parker, of New York, exhibits an extensive line of his patent Parallel Vises with recent improvements, among which we notice an adjustable collar, which causes the jaws to open or shut, upon the slightest movement of the handle. There is thus no lost motion; and again, if the shoulder on the screw should wear, the collar can be so adjusted in a few moments that it will operate as readily as when new. Another improvement, is an adjustable spring so arranged as to hold the handle of the vise in any position or angle at which the hand leaves it, thus avoiding the pinching of fingers, which is of frequent occurrence, when the ordinary handle is in use; and, again, if the workman wishes to hold any article, however slightly, he can do so, when, with the ordinary vise, the weight of the handle would either grasp the article too hard or release it entirely.

There is, perhaps, no finer display in this department than the exhibition of

SAWS,

by R. Hoe & Co., of New York, and the American Saw Co., also of New York. It would be impossible for us to enumerate here all the varieties of saws displayed. They are of all sizes, and of all shapes known to the saw trade, finished and mounted in superb style. Our readers are already aware of the distinguishing features of the saws made in each of these establishments as they have long been extensive advertisers in these columns. Their wares have earned a very high reputation. These firms, undoubtedly, lead the saw trade in this country. Fine taste has been shown in the arrangement of their collections at the Exhibition, and they are greatly admired by all visitors to the department. The punching of the saw plates shown by the American Saw Co., is performed, we are told, by Ivens & Brooks' combined punch and shears, a model of which was shown us. It is to be regretted, that this fine tool was not shown in operation at the Fair, as it is certain that it would have made a most favorable impression.

We take this occasion to say a word upon the

ELECTRIC ORGAN

exhibited by Hall, Labagh & Co., of New York. The strains of this instrument attracted our attention as we were about to leave the building after taking the notes we have condensed into the present article. This organ was described on page 347, last volume of the Scientific American. It is the invention of H. L. Roosevelt, of this city. The inventor has furnished us with the following particulars in regard to it: "The keyboard is detached from the organ at a distance of about twenty-five feet, though it might as well be removed to the distance of twenty-five miles, excepting for the necessity of the organist hearing his own performance, since we know from from recent scientific investigations that the electric current will travel a mile almost instantaneously. The only connection between the key-board and the body of the organ is a bundle or rope of flexible, insulated copper wires, which may be carried in any direction without injury, and there is no pull or strain on these wires, as they are merely the passive means of conducting the electric current.

"The source of the electric current is an ordinary 'single fluid' battery, placed in any convenient position, composed of a series of jars containing a mixture of sulphuric acid and water, and in each jar is suspended a plate of carbon, in company with two plates of zinc, connected in the usual way by copper wires. From one end of this series of jars, a copper wire proceeds to the keyboard; and, if we take the case of a single key, for example, when it is pressed down by the finger of the player, we shall find this wire so connected that it forms an unbroken circuit and proceeds from the keyboard onward to the body of the organ, where it is coiled around a soft piece of iron shaped like a horseshoe, and thence returns from the organ to the other end of the battery. When a wire is connected with both poles or ends of a battery the current passes and the piece of soft iron becomes a powerful magnet; but the moment the current is broken, by disconnecting the copper wire, there is an instant loss of power. When the key of the organ is not touched the wire is not connected and the current passes; but on pressing down the key a metallic contact is formed, the electricity darts along the circuit and the electro-magnet, becoming at once excited, pulls down the pallet or opens the valve in the wind chest, admitting air to the organ pipes, and, with lightning speed causes them to speak. The couplers are applied and the stops drawn upon the same principle."

We also noticed, in passing, some specimens of artificial stone, manufactured and exhibited by the New York Stone Works, Bandman & Hollman, 75 William st., New York. This stone is a conglomerate sandstone, artificially produced, and is molded into large blocks for hydraulic structures, and also into floor tiles and ornamental architectural work of all kinds. The exhibitors claim, that this stone is superior in strength to any natural sandstone found in the United States, and that it will not scale like the brown sandstone now largely in use for ornamental building. It can be given any color or shape desired, and is twenty five to seventy-five per cent cheaper than natural stone, cut into the requisite form. It can also be molded into statuesque forms.

American Manufacture of Machine Twist.—An error crept into our report on the Silk Department in our issue of October 9. It was there stated that the machine twist made annually in the United States amounted to a quarter of a million dollars. It should have been a quarter of a million *pounds*, the value of which would be fully three millions of dollars.

INTERESTING PATENT DECISION---WHEN DOES AN ENGLISH PATENT TAKE DATE?

The Commissioner of Patents has just given a decision in a case involving the question as to the date to be borne by patents which have been patented in foreign countries. The case on which the decision is given is the application of James Cochrane for the correction of the date of letters patent granted to him March 31, 1857, for an improved fluid meter. Cochrane obtained letters patent in England and also in the United States. The English letters patent were dated November 19, 1855, when the provisional specification was filed. They were sealed May 19, 1856. A caveat was filed in the U. S. Patent Office November 7, 1855, but application for the letters patent was not made until Nov. 5, 1856. The patent was granted March 31, 1857, but was limited to "fourteen years from the 19th day of November, 1855." The applicant now claims that the American patent should bear date from the day it was issued, and asks the correction of an assumed clerical error. The Commissioner says:

The motion presents several interesting questions.

1st. Can the mistake if it exists be corrected as a clerical error?

2d. Was there an error in limiting the American patent to fourteen years from November 19, 1855?

3d. If there was an error what is the proper limitation of the term of the letters patent?

After examining the first question and quoting quite a number of authorities, he arrives at the conclusion that it could never have been the intention of the Legislature to restrict the correction of errors to those enumerated. Accordingly it has been the practice of the office to correct all errors in parties' names titles, dates, and all omissions or insertions of words made by the fault of the office upon a surrender of the patent without fee, but to require the patentee when seeking the correction of his own mistakes to pay the fee and conform to the provisions made for cases of reissue.

The answer to the second question involves the inquiry as to the true date of the English patent, within the meaning of our laws. The act says "that no person shall be debarred from receiving any invention or discovery, etc., by reason of the same having been patented in a foreign country more than six months prior to his application; provided, that in all cases, every such patent shall be limited to the term of fourteen years from the date or publication of such foreign letters patent."

The words "date or publication" should the Commissioner hold to be construed conjunctively, the phrase in effect meaning date *and* publication, and if there be a difference between the two, the latter time should be held as the true date. After a review of the practice in the English patent law, the Commissioner says: "As the invention in its perfected, completed form is not published until the enrollment of the final specification, as in fact much of the invention may be made between the time of the filing of the provisional and completed descriptions, it would seem that the date and publication which is to determine the limit of a patent in this country, should be the date of the filing of the complete specification."

The answer to the third question as to the limitation of the term of Cochrane's patent. Under the act of 1836 the inventor who took out a patent in a foreign country more than six months prior to his application in this country forfeited his right to an American patent. But if within six months, it took date from its issue here and ran the full term of fourteen years. The 6th section of the act of 1839 had no reference to those who made application within the six months. If made within the time, it bore the date of issue and ran fourteen years from that date. This view of the case is supported by citations from various decisions. It follows, therefore, that in the present case, Cochrane's application having been filed within less than six months from the time when his invention was "patented" in England, his patent is not affected by the provisions of the act of 1839, and must be corrected so as to run fourteen years from March 31, 1857, the date of issue.

OSBORN'S NEW TREATISE ON THE METALLURGY OF IRON AND STEEL.

A brief notice of this valuable and extensive treatise appeared in our last issue under the head of New Publications. It was our intention at that time to give it a review commensurate with its importance, but we find that to do this adequately would absorb more of our space than can be spared for the purpose. We shall therefore content ourselves with an outline of the character and origin of the work, and some extracts from its pages, one of which will appear in connection with this notice and some others in future issues. The author tells us in his preface that before he began the present work it was thought that a simple re-editing of Overman's Treatise upon Iron, would be sufficient; but that "upon a thorough examination it was found impossible to make that work meet the wants of those who would justly expect a recognition of the many important inventions and discoveries since its last edition was published, and who would not wish to read of anything as a theory which had become a fact, or of procedures which had passed away before the advance of metallurgic science. The author has therefore written a work entirely different in manner and matter."

The work is divided into four parts, the first of which treats of the theoretic metallurgy of iron. Under this head we are presented with a chapter on "the general principles of the chemistry of iron, another on the ores of iron, one on the special properties of iron and its compounds, a chapter on the theory of fluxes, and lastly an exhaustive chapter on fuel, in which the principal kinds of fuel used in the iron manufacture and in steam production are discussed, with remarks on wood, peat, coking of coals, manufacture of charcoal, and analysis of coals."

In Part Second, the practical metallurgy of iron is taken up and exhaustively treated in twelve chapters, in which all the approved processes are fully explained with detailed descriptions of the various furnaces, hot blast ovens, blast machines, etc., now employed in the smelting of iron ores.

Part Third treats of the manufacture of malleable iron, recent improvements in the construction of puddling furnaces, present modes of refining, forging, rolling, reheating furnaces, shearing, piling, etc.; and Part Four is an essay on steel, in which the various kinds of steel and the numerous processes now employed in the steel manufacture are duly discussed, according to their importance.

We find that in this work a common error of authors upon such subjects, has been avoided, and much of the merit of the work consists in the fact that no detail is supposed to be known by the reader, and nothing is jumped, or left to inference. The method adopted is a good one. The author sets out by a sufficiently elaborate discussion of the substances which have to be dealt with in the manufacture of iron and steel, and from the chemical knowledge thus obtained, the reader is led naturally and easily into the practical details of smelting, puddling, and refining iron, and the subsequent operations by which malleable iron is produced.

We have selected the following extract as a fair example of the clear style in which the author writes, and as also giving a good idea of the important part which oxygen plays in the metallurgy of iron.

"OXYGEN.—The air we breathe contains a large amount of oxygen, which plays an important part in the affairs of iron manufacture. It contains a large portion of nitrogen, with which, as metallurgists, we have but little to do, even supposing that steel contains a small amount—into which supposition we may hereafter inquire. It contains a very small portion of carbonic acid gas, a compound of carbon and oxygen, the former of which two elements, also, plays an influential part, determining by its amount, as carbon in iron, whether that iron be cast iron or steel, and, by its absence from iron, that the metal in question is neither cast iron nor steel, but malleable iron.

"Another fact: the atmosphere always contains more or less vapor of water. This water is composed of a large proportion of oxygen, and also a proportion, equal to twice the volume of this last-mentioned element, of another element and gas, hydrogen. The latter element is soon to become better known to the metallurgical world, but it is the oxygen of the vapor of water to which our attention is now called particularly. Here are *four elements*, important in the following order: oxygen, which is the supporter of all combustion, whether as flame or burning coal, and, like that which it supports, a splendid servant, but a labor-exacting master, ever waiting and watching, in its elementary loneliness, to unite with that for which it has affinity, either to help or perplex. Its union with iron forms that which we call the "rust" of iron, in which we see this affinity accomplished, for it has recalled the metal back to its primal state, namely, that of an ore, from which ore, or rust, it was made to become a metal only by the stronger affinity of the same element oxygen for carbon, whereby the act of rusting the carbon was followed by heat enough to expel oxygen from the iron rust in the ore, and leave the metal pure. That rust of carbon is the carbonic acid gas of the chemist. However rapidly in the one case, or slowly in the other, this affinity of oxygen may be exhibited, it is an affinity always in entire subjection to a stronger law of proportion, which it never violates, whether in the long-continued processes of nature, or the more intense and rapid fires and reduction of the furnace. That stronger law is seen in this: oxygen unites with iron in the proportion of only one atom of oxygen to one of iron; or, where a stronger cause exists, and larger affinity is exhibited, it is (never otherwise than as) one and the half of one atom of oxygen to one atom of iron (Ferric Acid excepted). Now, for the sake of brevity, the one-to-one proportion is called the one-oxide, or protoxide, and the other the one-and-a-half oxide; or, using the convenient Latin term, sesquioxide.

"Thus we have only two rusts, or oxides of iron, the protoxide and the sesquioxide. The latter is the highest affinity oxygen ever exhibits for *iron*, whatever higher affinities it may exhibit for other substances or elements. This oxide, therefore, may also be called the "high oxide," or, again resorting to the convenient Latin syllable "per," the peroxide of iron; so that the sesquioxide of iron, in this particular case of iron, is the peroxide, as there is no greater affinity of oxygen for iron known.

"In the case of carbon, however, we know of an affinity of one atom of oxygen to one of carbon; and again two atoms of oxygen to one of carbon. The former is always known as the oxide of carbon, or *carbonic oxide*, and the latter, inasmuch as the gas partakes of such acid properties that it will readily redden litmus paper (the chemist's test for acids) is called carbonic acid, or carbonic acid gas. Carbon is consumable, and oxygen, as we have said, supports combustion; all the conditions, therefore, of flame or fire, exist in carbonic oxide, and it is not remarkable that it is inflammable, and that the combustion should be attended by great heat. But an anomaly does present itself in the case of the other oxide of carbon, wherein the oxygen exists as the *peroxide*, or two-oxide state. We can and need only state this anomaly, namely, that where two parts of oxygen with one of carbon exist, combustion no longer exhibits itself, nor will the gas of this composition allow any combustion to take place wherever its presence exists to any great degree. When, however, from any stronger attraction or affinity, one atom of oxygen is drawn off from the two which go to form carbonic acid gas, and the resultant gas becomes possessed of only half as much oxygen as it previously possessed, the gas immediately becomes inflammable, and burns with great heat. Singular as it may seem, the addition of two atoms of the flame-supporting element, oxygen, to one of the combustible element, carbon, produces a gas which ceases to burn, nor can any combustion take place where its presence is abundant."

STEAM POWER ON CANALS.

In the annual report of the Hon. Van R. Richmond, State Engineer and Surveyor, noticed in our last, we find the following on the use of steam on our canals:

"Attempts have hitherto been made to substitute steam for horse power upon the canal. These have all thus far failed, probably from the fact, that the machinery used was not properly proportioned to the work which it was designed to perform, and that too high a rate of speed was sought to be obtained. The law connecting the resistances offered to bodies moving in water with the power required to overcome such resistances, may be stated as follows:

"The resistance varies as the *square* of the speed and the power exerted varies as the *cube* of the speed; hence, if two horses were sufficient to tow a boat at a speed of two miles an hour, the number required to tow the same at a speed of four miles per hour would be $(2—\frac{4^3}{2^3}=\frac{2 \times 64}{8})$ 16 horses. It appears, therefore, in order to double the speed, the propelling power must be increased eight times. The obvious effect of the double speed would be to reduce the time of transit one half; this, however, would be secured only at an expenditure for propulsion eight times as great as that due to a speed of two miles per hour.

"The foregoing determinations and comparisons are based upon the assumption that two horses will tow a loaded boat at a speed of two miles per hour upon the canal; as shown by M. D'Anbuisson's formula, 44 per cent more power is required to maintain the same speed in an indefinite fluid. For example, as shown in a former calculation from D'Anbuisson's formula, the traction or resistance encountered upon the Erie canal with the large class of boats, carrying 210 tuns, at a speed of two miles an hour, is 428 pounds, requiring about three horses; then the resistance, at a speed of four miles an hour, would be $(\frac{4^3 \times 428}{2^3})$=3,424 pounds, requiring over 23 horses.

"If steam power should be provided sufficient to obtain an average speed a little in excess of that realized from present horse power, then it might undoubtedly be successfully and economically employed upon our canals.

"A successful application of the principle of low speeds seems to have been made by Mr. Edward Backus, of Rochester. If the result of the several trials made, are correctly stated by the inventor of this novel mode of steam propulsion, then the cost of transportation may be reduced about 32 per cent, as obtained from the following calculation, based upon the same general method employed for determining the cost of horse power. It is stated in the circular of results, by the inventor, that the extra cost of machinery and placing same in the boats is $2,500, and the consumption of fuel from 1,500 to 1,660 pounds of coal in twenty-four hours. Taking the same average for the boats hitherto used, and allowing 20 per cent for the aggregate detentions for the season (the same as now realized), and the following shows the cost of transportation:

Cost of boat and furniture	$5,000
Cost of machinery	2,500
Interest on same	5,250
Repairs of boat and interest on same	2 061
Expense of crew (same on boat with horse power; $185 per month	16,556
Expense of fuel (1,660 lbs. coal per day for 2,263 days) at $7 per tun	13,174
Total expense for ten years	$44,541
Total expense for one day	$19 64
Forty miles averaged per day for the season, per mile	49·1 cents
156 tuns average cargoes for the season, per tun per mile	3·14 mills

showing a saving of 32 per cent over horse power.

"The consumption of fuel, as reported, seems greatly in excess of that required, and can, undoubtedly, be reduced one half when the system shall have been perfected. Should this saving be realized, the cost per tun per mile will then be $2\frac{36}{100}$ mills, a saving of about 50 per cent.

"The following extract from a letter written by Gen. Quimby, U. S. A., who witnessed two trials of this boat, will convey an idea of the character of this new mode of propulsion:

"In this boat the motive power, steam, causes a wheel located near the center of the boat to roll on the bottom of the canal, and thus drive the boat in the same manner that the locomotive is propelled by its driving wheels. The wheel, placed at one end of a lever frame, readily adjusts itself to the varying depths of the water, and its weight, together with the cog-like projections distributed over its circumference, prevents slipping and consequent loss of traction. It has been found that in the whole extent of the Erie canal there are not to exceed twenty miles in which the depth of the water is too great for the wheel to work well. For very deep water, a screw propeller wheel is used and the motive power is changed from the ground wheel to it with the utmost ease and expedition."

Dredging in the Gulf Stream.

Our readers are, perhaps, aware that a scientific examination of the ocean bottom in the Gulf Stream has been in progress under the direction of Professor Agassiz, assisted by M. de Pourtalès. The *Atlantic Monthly* for October has an interesting article upon this subject, from which we collate some particulars of the method employed and the object of this examination.

"Dredging in great depths is a slow and rather tedious process, requiring not only patience but very accurate observation. M. F. de Pourtalès, of the Coast Survey, has been engaged on board the *Bibb* for the last three years in making dredgings in the Gulf of Mexico. These dredgings have included every variety of depth, from the shore outward to soundings of six, seven, and eight hundred fathoms, eight hundred and sixty fathoms being the deepest. They have brought to light the most astonishing variety of tiny beings—especially crowded on rocky bottoms, but not altogether wanting in the deepest mud deposits. A report of the results obtained in his first two years' dredgings has been partially published by M. de Pourtalès in the Bulletin of the Museum of Comparative Zoölogy at Cambridge. They form a most valuable contribution to our knowledge of the animals existing in the deep sea.

"The dredge is a strong net about a yard and a half in length, surrounded by an outer bag of sail-cloth. Both are open at the bottom, but laced above around an oblong frame of iron. This frame has two arms, with a ring at the end of each. One of these arms is securely fastened to the line by which the dredge is let down; but the other, instead of being attached to the line, is simply tied by a weaker cord to the first. This is in order that, in case the dredge should be caught on the bottom, as often happens, one of the arms may give way, allowing it thus to change its position slightly and be more easily freed. It is an important precaution; for sometimes the dredge is caught so fast that it requires not only the force of the small engine to which the reel, holding seventeen hundred fathoms of line, is attached, but the additional strength of all hands on board, to disengage it. When the dredge is lowered—being of course weighted, so as to sink rapidly—a cord is tied around the bottom of the net, while the sail-cloth is left open; thus allowing the free escape of water from the former, while the sail-cloth protects it from injury. When the dredge is landed on deck, a tub or bucket is placed under it, into which all its contents fall the moment the cord around the bottom of the net is untied. Some-