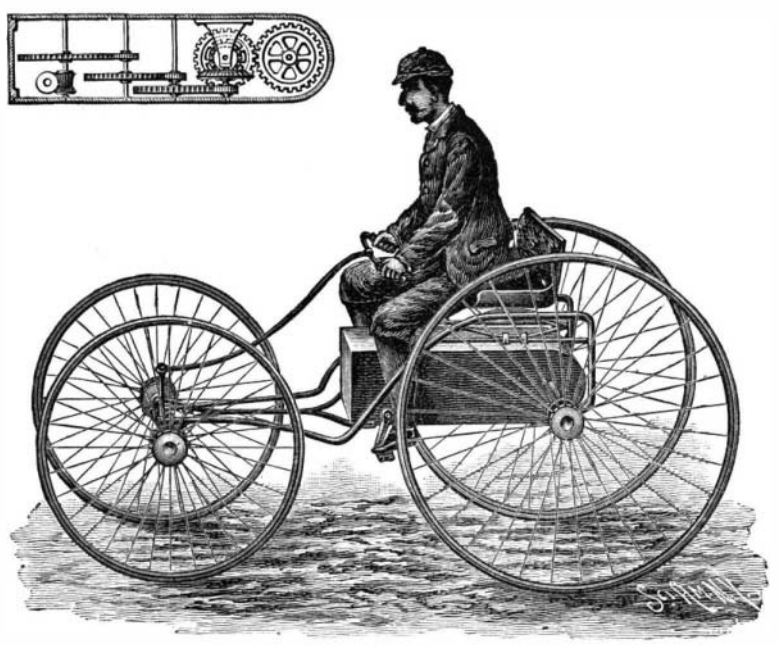
A DRIVING MECHANISM FOR VELOCIPEDES.

A mechanism designed to be readily applied to any form of velocipede, to impart a regular, positive and powerful motion from the pedal shaft to the axle of the driving wheels, is illustrated in the accompanying engraving. It has been patented by Messrs. Walter A. Evans and Thomas Cowan, of No. 267 Graham Street, Winnipeg, Canada. The driving mechanism, a vertical section of which is shown in the small view, is inclosed in a casing through the rear end of which the driving axle of the machine passes, while the pedal shaft is journaled in the forward end of the casing. A worm on the pedal shaft meshes with a worm wheel on a vertical shaft in the casing, the pedal shaft turning fifteen times to impart one revolution to the worm wheel. The motion is thence transmitted, by spur wheels and pinions, as shown in the sectional view, the speed being constantly increased, to a short shaft journaled in a bracket in the casing, and which carries a bevel gear meshing with a bevel pinion through which motion is transmitted, through a large spur gear, to a spur gear on the driving axle. The arrangement is such that the driving wheel will be turned about four and a half times, or practically so, for each revolution of the pedal shaft. A similar driving mechanism may, if desired, be employed in connection with mowers or binders, by placing the worm on the axle, when the drive wheels will act direct upon the worm wheel.



EVANS & COWAN'S VELOCIPEDE.

ONE KIND OF CAM.—*Concluded.*

BY A. D. PENTZ.

A machine to cut a cam of this character is a very simple one when made, but there are points in its construction that must be closely observed in the designing, and carefully watched in the building of it. Cams of this kind, if cut by the periphery of a cylindrical cutter, may do well with cutters of one particular size, but will fail with either smaller or larger cutters. In one shop where a great many of this kind of cam are made, it is found well to finish them to a former by a single pointed tool. This is good practice for quality, but needs too much tool sharpening and tool setting. In another shop the cylindrical cutter is used, but when the size of the cutter is materially reduced by resharpening, it is replaced. This is practical in that particular place, because the worn cutters may be used for other work after their sizes are so reduced that they no longer are fit to make good cams with on the machine. A fine engineer, now in Scotland, designed a machine to sequently change the centers of rotation in cutting this kind of cam, so that each arc is cut while the cam is being turned on the theoretical center of that arc. This machine worked finely, but it was necessarily elaborate in design, and had such precise points of construction that tool makers are scarce who are capable of getting all its points exactly correct. I have not seen a machine that can cut these cams of various sizes or of different centers of arc without special formers for each size and each shape.

While these cams are very useful, they heretofore have been not so difficult to cut as difficult to keep precise to sizes and to uniform diameters in the same cam. The difficulty has not been from neglect in not having competent engineers to design, but in overcoming the effect of differing sizes of cylindrical cutters cutting with thei peripheries on an irregular rotating shape. As the cam turns from the smaller to the larger radius, a large cutter will meet the larger coming part sooner than a small one, and in descending the reverse of this is true. Of course these cams are generally mounted to rotate, while being cut, and arranged so that their mean centers are concentric to the spindles that carry them. But this, while it is a help, is but a partial cure at best.

Having given this problem some thought during my experience, I herewith submit a sketch of a machine that I believe will work, give accurate results, and produce more cams than any other method yet tried.

This machine, as sketched, indicates rather than designs many of the details; but the general plan is what is suggested. The details of construction would vary in each shop to harmonize with the practice of each shop.

Fig. 1.

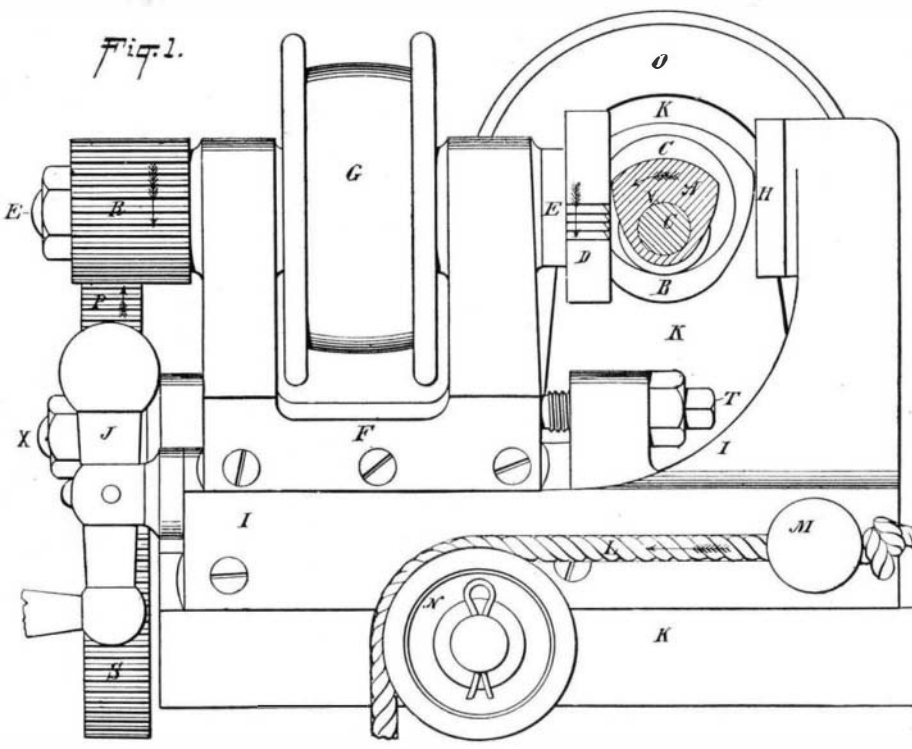
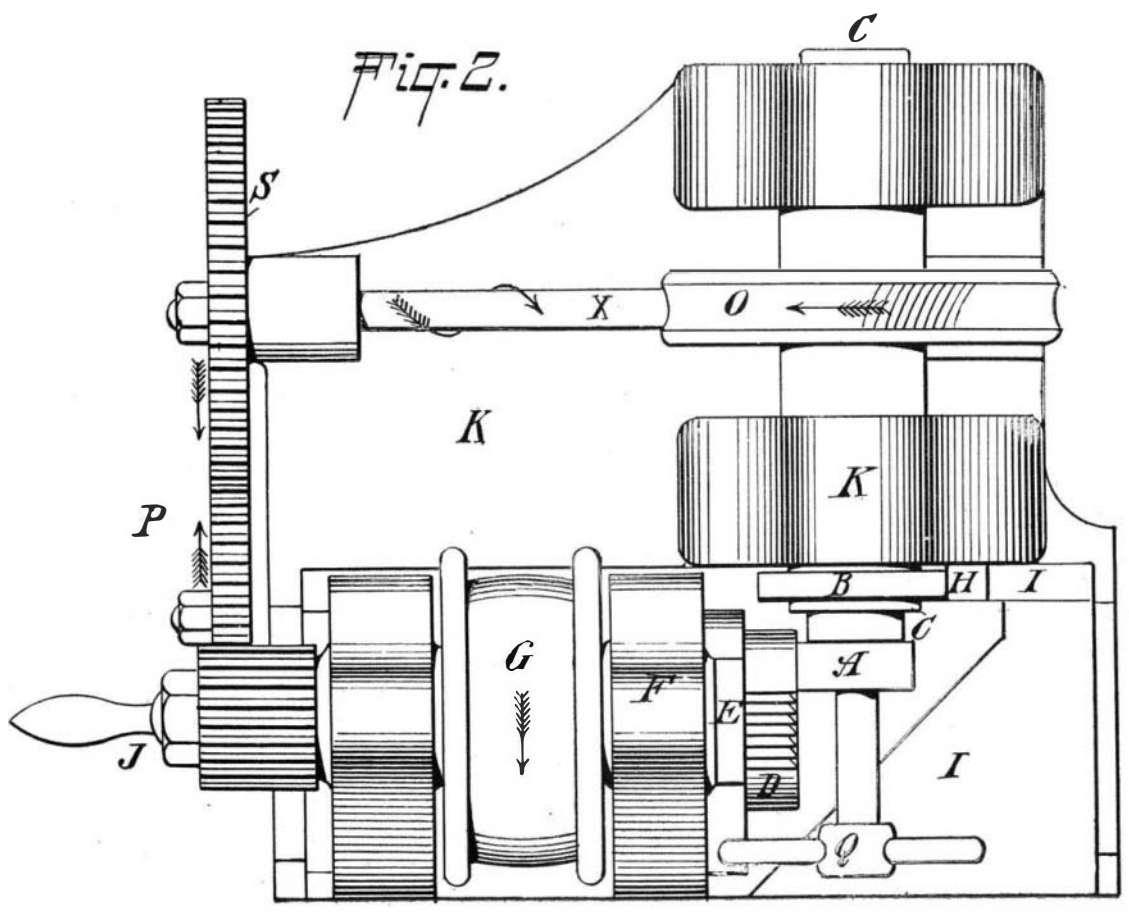


Fig. 2.



In the sketches, A is the cam in operation, mounted on the spindle, C. In Fig. 1, the cam and its arbor are cut in section to indicate their relative positions to the center, V, of the spindle, C. B is the former, from which the cam in operation takes its shape. D is the cutter, mounted on the spindle, E. This spindle must be exactly square with the spindle, C, and the centers of both these spindles must be cut by the same horizontal plane. The cutter, D, also must be exactly flat on its face, must be large enough to more than cover the width being cut, and have teeth on its periphery as well as its face. This cutter, thus arranged, will not cut a shoulder against a hub that is perfectly square, and as this is, I believe, never necessary, it matters not. F is the headstock, adjusted by the screw and handle, J, and located by the stop, T. G is the pulley that drives the whole machine positively. H is shoe on the carrier, I. This shoe is of hard steel, and the plane on H that is in contact with the former, B, must be exactly perpendicular, or square to the center of the spindle, E, in all directions. The former, B, should also be of hard steel, ground to shape. It will be well if there be an oil cup fastened to the frame, K, and situated so that this former will continually pass through the oil. The carrier, I, is attached to the frame, K, by a common slide device, and through it the shoe, H, is held to the former, B, by a weight suspended from the cord, L, which operates about the wheel, N, and is fastened to the stud, M. On the upper side of I is a slide, to which the headstock, F, is attached, so that the motions of I are all communicated to F, and thus the cutter, D, is always at the same distance from the shoe, H; and because its cutting face is parallel to the face of this shoe, H, it must, if the stop, T, be rightly set and the former be correct in shape, cut correct cams.

It will further be seen that the cutter, D, may be reduced by sharpening to any thickness, and the parallel effect with the face of H will not be impaired; and, further, that in adjustment, after sharpening the cutter, the only part to be moved will be the screw, T. By thus opposing the shoe, H, to the cutter, D, a much lighter weight is required to keep the contact against the former, B, than otherwise would be needed.

The cam is held to its place on the spindle, C, by the T-nut, Q, which fits a screw on the end of the arbor within the cam.

R is a pinion on the end of spindle, E. It engages the intermediate gear, P, and it is long enough on its teeth to permit the headstock, F, to be adjusted without affecting the engagement with this gear, P. The worm gear, O, rotates the spindle, C, being driven by a worm on the shaft, X. This shaft, X, is driven by the gear wheel, S, and connected to the spindle, E, by the intermediate, P, and the pinion, R.

Thus if the pulley, G, be driven by a belt, the cutter, D, will remove the metal on the cam, A, and the train of gears operated by the pinion, R, turns the shaft, X, and through the worm gear the spindle, C, which progressively brings the cam to be cut on the whole surface. The gears S and P are, by a mistake in drawing, made too thick in Fig. 1.

While this machine has never been made, my experience with the problem convinces me that it will fill the bill.

THE sun never sets on the soil of the United States. When it is 6 o'clock at Attoo Island, Alaska, it is 9:36 o'clock A. M. the next day on the eastern coast of Maine.

Degeneration and Evolution.

Mr. H. G. Wells, writing for the *Gentleman's Magazine* (London), says: Perhaps no scientific teaching has been exposed to a greater amount of popular misconception than the doctrine of evolution. In the popular conception, life began with the amœba, then came jelly fish, shell fish, and a miscellaneous mass of invertebrates; then real fishes and amphibia, reptiles, birds, mammals, and man, the last and first of creation. This is not the teaching of science. On the contrary, biology, along with advance, teaches retrogression as its essential complement. Isolated cases of degeneration have long been known. It is only recently that the enormous importance of degeneration as a plastic process in nature has been suspected and its entire parity with evolution recognized. In fact, the path of life so frequently compared to a steady ascent, an indication of an inevitable tendency to higher and better things, is distinctly repudiated by scientific observers. The sounder view is that living species have varied along divergent lines from intermediate forms and by no means necessarily in an upward direction.

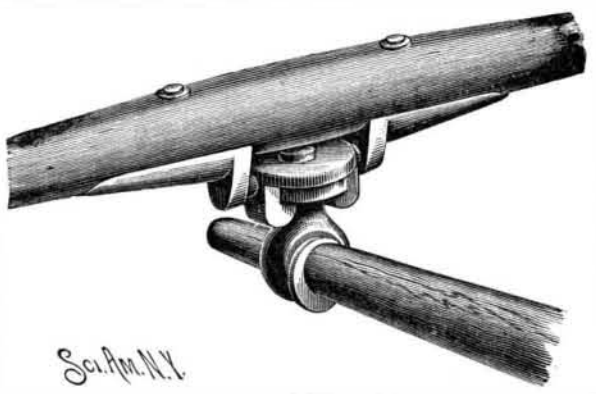
The best known and perhaps the most graphic and typical illustration of the downward course is to be found in the division of the Tunicata. The untrained observer would probably class it near the oyster and the mussel, and a superficial study of its anatomy might even strengthen this opinion. As a matter of fact, however, these creatures are far more closely related to the vertebrata, a fact exhibited in the details of their development. It is a matter of common knowledge that living creatures in the course of their embryonic development repeat, in a more or less blurred and abbreviated series, their generalized pedigree. For instance the developing chick or rabbit passes through a fish-like stage, and the human fœtus wears an undeniable tail. In the case of these ascidians (the Tunicata) the fertilized egg cell destined to become a fresh individual follows an entirely different course from that pursued by the mollusks, the dividing and growing ovum exhibits phases resembling in the most remarkable way those of the lowliest among fishes, the lancelot, or amphioxus. The method of division, the formation of the primitive stomach and body cavity, and the origin of the nervous system are identical, and a stage is attained in which the young organism displays—or simulates—vertebrate characteristics. It has a notochord, or primary skeletal axis, it displays gill slits behind its mouth, as do all vertebrated animals in their earlier stages, and the origin and position of its nervous axis is essentially vertebrate. In these three independent series of structures the young ascidian differs from all invertebrate animals, and manifests its high descent from the vertebrates. It is an evident case of retrogression.

Like a tadpole, this animal has a well developed tail, with which it propels itself vigorously through the water; it has serviceable sense organs, and appears in this, its earlier stages, to be full of vigorous, enjoyable life; but scarcely is this stage attained before the animal undergoes a process of retrogression. It develops suckers, by means of which it attaches itself to the rocks, its tail is absorbed, eye and ear atrophy, and the skin secretes the coarse inorganic-looking "test;" the transient glimpse of vivid animal life is forgotten, and the creature settles down for life to a mere vegetable existence. In some cases the degradation has been a strategic retrogression—the type "stoops to conquer." This is, perhaps, most manifest in the case of the higher vertebrate animals. It is one of the best known embryological facts that a bird or a mammal starts in its development as if a fish were in the making, and that later the organs get twisted and patched to fit a life out of water—nowhere organs built specially for this very special condition. There is nothing like this in the case of a fish. There the organs are from the first recognizable sketches of their adult forms, and they develop straightforwardly, but the higher types go a considerable distance toward the fish, and then turn round and complete their development in an entirely opposite direction. This turning is evidently precisely similar in nature, though not in effect, to the retrogression of the ascidian after its pisciform or larval stage.

If a zoological investigator could have visited the earth during the upper Silurian period, and with prophetic eye could have singled out the ancestors of man, he would have found them, not among the dominant placoid fishes of the Silurian sea, but in the *Dipnoi* or mud fish, swimming in the pluvial waters, or inert and caked over by the torrid mud. He would have found in conjunction with the purely primitive skull, axial skeleton, and fin possessed by these Silurian mud fish a remarkable adaptation of the swimming bladder to the needs of the waterless season. It would have undergone the minimum amount of alteration to render it a lung, and blood vessels and other points of the anatomy would show correlated changes. Here we have the old story of degeneration over again; the mud fish had failed in the struggle, they were less active and powerful than their rivals of the sea, and they had taken the second great road of preservation—flight. Just as the ascidian has retired from an open sea, too crowded and full of danger to make life worth the trouble, so, in the older epoch, did the mud fish. They preferred dirt, discomfort and survival to a gallant fight and death. Very properly, then, they would be classed in our zoologist's scheme as a degenerate group. But some of them have risen in the world again; they came out of the rivers, gave birth to the amphibia of the coal, which gave place presently to the central group of reptiles, from which sprang divergently birds and mammals, and finally the last of the mud fish family, man—the heir of all the ages.

AN IMPROVED NECK YOKE.

The yoke center for connecting the neck yoke with the pole of a vehicle, as shown in the accompanying illustration, has been patented by Messrs. David H. Gotshall and Herbert Petit, of No. 507 Second Street, Astoria, Oregon. The yoke is of the usual construction, and in elbow lugs attached by bolts to its under side are journaled the trunnions of a circular plate having a depending flange, which extends around all the front side of the plate, and is doubled under at right angles to receive the head of a pole ring. The head may be readily slipped into a recess of the plate, and a neck between the body of the ring and the head comes opposite the bent portion of the flange, so that the ring may have all necessary movement. The ring is prevented from accidental removal by a pin extending through the plate and into the head of the ring, but there will be little strain on the pin, the lateral strain from the flat head coming on the flange of the plate. The ring is lined with leather or other suitable material to prevent wear and rattling. This yoke center is



GOTSHALL & PETIT'S NECK YOKE.

designed to be safe, durable, and inexpensive, moving freely in relation to the pole, while not permitting the yoke to pound thereon.

Modification of the German Patent Law.

An amendment of the patent law of 1877 has been passed by the Reichstag, and went into force on the 1st of October. The chief point to be noticed in the new law is that the examination of patents with regard to novelty is not to be abolished. The new law does not decide what amount of invention is patentable, so that this question must be settled in each case by the Patent Office as heretofore. Publication, if made more than a hundred years ago, is not to act in anticipation of a patent. Patents taken out in foreign countries are to act in anticipation against the inventor, and those claiming rights under him, only after a lapse of three months, and thus an extended period of time is allowed by the act for an application for a patent in Germany. If an invention is stolen from another person, and an application for a patent has been made, the inventor is able not only to oppose the granting of a patent to the applicant, but to obtain a patent for his own application. The patent fees may be paid for the whole duration of a patent in advance, so that the lapse of a patent through delay in the payment of fees may be rendered impossible. If a patent on which the full fees have been paid should be afterward annulled, the fees will be returned to the patentee. An application for the annulling of a patent shall not be made when the patent has been in existence more than five years. For the determination of this point, however, a period of three years is provided. The very high fees now payable for a German patent have not been diminished by the new act, but it is provided that such a lowering of the fees may be made by order of Federal Council. The important provision that a patent may be revoked after the expiration of three years if the patentee fails to carry out his invention in Germany to a suitable extent, or at least to do everything that he can to carry it out, remains in force, and should be particularly noticed by foreigners. The organization of the Patent Office is to be so regulated by the new act that there may be greater security for a proper and efficient examination of patents. Before an application is refused, the applicant is to have an opportunity of answering objections to the granting of a patent. If he should fail to obtain a patent, he may then support his claim by oral evidence. At the preliminary examination expert witnesses may be called, and a statement of the various attempts which the inventor had made may be presented. If the decision of a judge puts a new aspect on the case, the applicant is to have an opportunity of answering any objection raised. A proviso which is of great importance to chemical industries is that where proceedings are taken to patent a new material, every material of similar manufacture is regarded as included in the claim until proof to the contrary is shown. The damages payable for the infringement of a patent have been increased. The Patent Office, Berlin, was established at its new building in April last. This new office is in every respect suitable for its purpose, whereas the old one was too small. The public obtain a great advantage from the new arrangement, since the important technical library is now open to all persons from 9 A. M. to 9 P. M.

Lumber at Portland, Oregon.

The *Oregonian*, in speaking about the lumbering interests of Portland and vicinity, says: The principal forest tree indigenous to Oregon soil is the fir. For heavy frame work of all wooden structures, for bridge timbers, and even for boat building, the fir is the best timber in the world. It has all the tenacity of fiber of the best oak, without the propensity to split of the latter, and its lasting properties, when exposed to all the severity of weather, are not equaled by any other available timber in the world. It has been found by actual experiment that a piece of fir timber, when submitted to a heavy strain, did not break as soon as a piece of well seasoned oak of the same dimensions. It is only within the last five years that the Union Pacific, one of the greatest of the transcontinental lines, became convinced that fir was the safest, most economical, and strongest timber for wooden bridges that could be obtained in the United States, and Portland-cut fir is now regularly shipped by this company as far east as Omaha, for use in their new reconstructed bridges. Large quantities of this same wood are now used by this company in the construction of cars for their line.

The average price at the Portland mills, for both rough and dressed lumber, is about $14 per 1,000 feet. This price may vary a little at times, but long years of experience in this line has convinced the mill men of this city that lumber cut here cannot be sold profitably on an average for less than these figures.

The supply of logs for the local mills is now obtained from the banks of the Columbia River and its tributaries north of Portland. Along the banks of the upper Willamette there is a supply of good timber, but this timber cannot reach Portland, owing to the obstructions to floating rafts in the falls of the Willamette, at Oregon City, twelve miles north of Portland. The large rafts of logs from the Columbia are now towed up to the Portland mills by steamers regularly engaged in this traffic, at the rate of about 75 cents per 1,000.

Up to within a year past the Portland sawmills enjoyed a large and steady sale of their product to all points on the Union and Northern Pacific between Portland and the Missouri River. Last season most of this trade was cut off from the Portland mills, owing to the scarcity of cars furnished by the railroad companies for the transportation of this lumber East. The lumbermen of Portland have a great cause for complaint against the transcontinental lines of roads out of Portland the present season, in the matter of discriminating freight rates on lumber in favor of the South, as against Portland. A delegation of the Portland lumbermen, headed by Mr. H. R. Duniway, one of the youngest but brightest men in this business in the Northwest, recently went East with a view of laying their complaint before the traffic managers. Chairman Walker, of the Western Traffic Association, has called a meeting of the traffic managers of the different railroads in the association for this month, and it is the hope of the lumbermen of Portland that new rates will be made on the shipment of lumber which will be entirely satisfactory to the Portland mills.

In addition to the cutting of fir, cedar is sawed in small quantities by the local mills, and oak and ash are sawed, to a limited extent, by small mills in Portland. Along the low lands of the Columbia and Willamette Rivers are immense forests of cottonwood, a wood that is specially valuable for box making and for the manufacture of wood pulp for paper making. This latter wood is now sent to Portland in considerable quantities for the purposes above named.

The sawing of lumber in Portland furnishes steady employment to about 800 men, and yearly pays out in wages $600,000. There is about $1,900,000 invested in the saw mill plants of Portland, and the yearly sales of lumber made by these mills will approximate $2,500,000.

THE tide tables for the Atlantic Coast of the United States, together with 206 stations on the Atlantic Coast of British America, for the year 1892, published by the United States Coast and Goedetic Survey, are now ready for issue, and copies can be obtained for twenty-five cents at the agencies of the survey in this city, or by addressing the office at Washington.