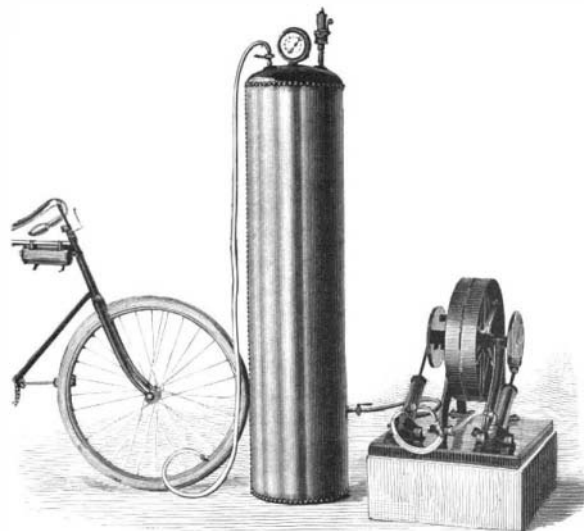


BICYCLE POWER AIR PUMP.

The illustration represents a highly efficient apparatus more especially designed to serve the convenience of bicycle manufacturers for inflating pneumatic tires, and for which a patent has recently been granted to Frank N. Stevens, of the Davis & Stevens Manufacturing Company, Seneca Falls, N. Y. The pump is double acting and has two oscillating brass cylinders, each two by eight and one-half inches and each screwing at its lower end into a head with trunnions turning in bearings on the base, there being in the bottom of each head a packing ring which makes a very tight joint to prevent leakage. The piston rods, extending through the open ends of each cylinder, connect with

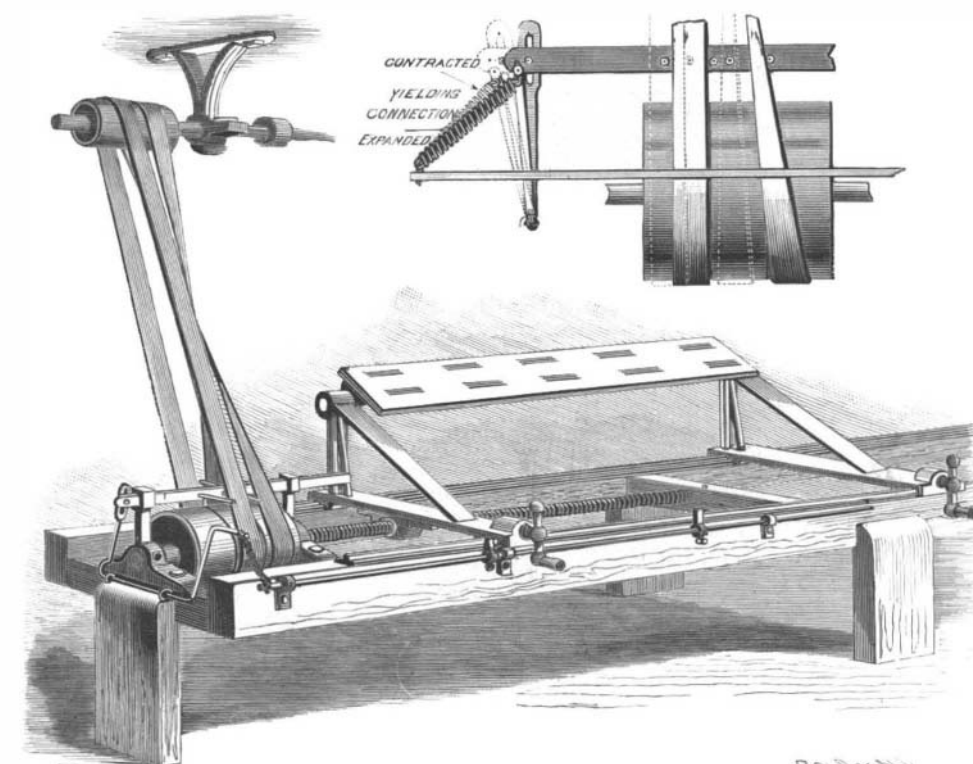


THE STEVENS POWER "CYCLONE" PUMP.

crank disks on a driving shaft on which are tight and loose pulleys eighteen inches in diameter, the disks having their wrist pins set opposite each other, so that the pistons compress the air alternately to insure a continuous operation of the pump, which is also adapted to be operated by hand power. Each piston is formed with a cup of leather or rubber, into which fits an expansible disk or spreader with slotted flaring sides, in which washers are held by a nut screwing on the lower threaded end of the piston rod, so that the sides of the cup are made to form a close contact with the inner surface of the cylinder. The valve casing at the bottom of each tube has an outlet valve communicating with a tube which is connected near its middle with a tank or reservoir in which the compressed air is stored, this tank being made of different capacities and being provided with pressure gage, safety valve and stop cock. The construction of the pump is such that any part may be readily repaired in case of wear or injury.

AN AUTOMATIC BELT SHIFTER.

The illustration represents an improvement in belt-shifting devices where the operating shaft has a central fixed or drive pulley, a pair of loose pulleys at each end, and a straight and a crossed belt, the shifting bar being automatically moved by the running machine. The improvement has been patented by George A. Smith, and is being introduced by Cohoke Woodenware Manufacturing Company, Cohoke, Va. With the ordinary belt shifting devices the throw is frequently insufficient, and sometimes, when shifting the crossed belt from the loose to the fixed pulley, both belts will be left upon the loose pulleys, and the improvement provides a shifting mechanism which, when



SMITH'S AUTOMATIC BELT SHIFTING MECHANISM.

acted upon by the first part of the movement of the operating rod or bar on the machine, stores up power sufficient to cause the shifting bar to move continuously to the completion of its stroke. The larger view shows the improved device applied to a grinding machine, where the front end of the shifting bar is pivotally connected to the inner crank end of a rocker or vibrating member, which has on its outer end a corresponding crank arm adjustably connected by a stout coil spring with the operating rod or bar on the frame of the machine, stops on the latter bar being engaged by the carriage at the end of each reciprocal movement. Eyes at the ends of the coil spring afford means for adjusting the tension of this yielding connection, by which power is stored up to continue or complete the shifting action of the shifting bar, and make positive the shifting of the belts. The smaller figure shows the position of the belts and the shifting bar in full lines, the dotted lines indicating the position to which they are brought by the yielding connection, such position being attained instantly after the carriage and operating shaft is momentarily stopped, the fast pulley having been freed of either of the belts.

Fire Balls at Sea.

One of the most remarkable electrical storms at sea, which probably seemed intensified by reason of the fact that a cargo of Spanish iron ore passed through it, was experienced by the British steamship Mercedes, which arrived at this port recently from Bilbao. On the Grand Banks of Newfoundland during the nights of December 3 and 4 the ocean appeared like a mighty mass of flames or an endless stretch of prairie fires. Balls of electric fire hissed and exploded in all directions and darted among the vessel's masts and rigging.

The Mercedes' escape from going down on December 1 seemed little short of a miracle. She was struck by a south-southwest gale, which was accompanied by seas rolling fearfully high. During the height of the storm a huge deck derrick, weighing many tons, was torn loose from its fastenings and swept overboard, leaving a hole in the vessel's deck through which the water ran into the cargo. In its course it carried away the maintopmast, which was also of iron; part of the flying bridge, the after winch, and part of the deck fittings. The decks were flooded with tons of water, the ship rolled at an angle of seventy degrees, and the sea broke in all directions, filling the cabin and the officers' quarters.

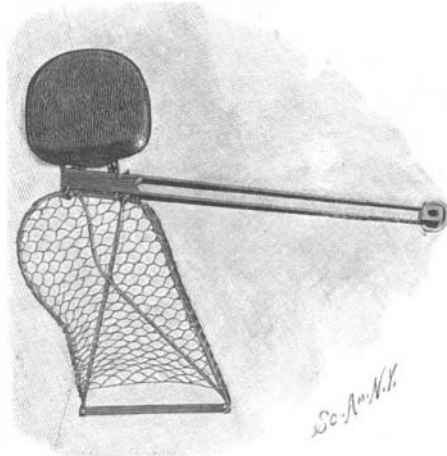
Soon afterward the storm partially subsided, when the electrical fire appeared in all directions. It hung in big balls for two nights from the masts and fore and aft stays, and practically turned night into day. As the big fire balls came together they would burst with a loud report upon the vessel and disappear. Under this light at night such temporary repairs were made as were deemed necessary to reach port.

Captain Tait of the Mercedes stated that the passage was one of the most trying experiences of his life. The rolling and lurching of the vessel in the storm and the fury of the gales were terrific in the vicinity of 25° longitude. Only the heroic work of the officers and crew saved the vessel.—Phila. Record.

ALUMINUM is being used in making the bodies of cabs.

A BICYCLE ADAPTED TO CARRY TWO PERSONS.

To facilitate carrying on the ordinary wheel a passenger in addition to the one who is propelling the machine, and to hold a lady's skirts out of contact and entanglement with the wheels, the improvement shown in the accompanying illustration has been patented by Harry J. Getman, and is being introduced by Henry A. Lederle, of Traverse City, Mich. It consists of an elongated clip frame attachment, shown separately in the small view, and composed of two par-



LEDERLE'S BICYCLE ATTACHMENT.

allel rods joined at the front by a block, and connected to the rear upright by a bolt, the front portions of the frame resting on the collar of the bicycle frame. Securely attached to the front of the clip frame is a transversely bent rod extending to one side, on which is a seat, while bolted rigidly to the opposite side of the clip frame is a skirt or leg support, composed of a framework of metallic rods, over which is secured wire gauze or netting. This support extends rearwardly and outwardly from the left hand side of the machine, and curves downwardly from the clip frame, to conveniently support the limbs and skirts of the person on the forward seat and afford such a balancing of the weight as will prevent undue torsional strain of the parts, and avoid liability of breaking or bending.

Force of the Human Jaws.

Experiments are reported to have been made by Dr. Black, a dentist of Jacksonville, Fla, to determine the force exerted by the human jaws in chewing food, and also the greatest force which the jaws are capable of exerting. By means of a spring instrument provided with a registering device he took—according to the account given—records of about one hundred and fifty bites of different persons, fifty of these being preserved as characteristic of the ordinary man, woman, and child. The smallest pressure recorded was 30 pounds, by a little girl seven years old, with the incisors, but, using her molars, the same child exerted a force of 65 pounds. The highest record was made by a physician of thirty-five, the instrument used registering only 270 pounds, and he simply closed it together without any apparent effort, there being also no method of determining how far above that figure he could have gone, and the test was made with the molars. Several persons exceeded a force of 100 pounds with the incisors and 200 with the molars. Dr. Black states that the physical condition of the persons experimented upon seemed to but slightly influence the result, and he is of the opinion that the condition of the periodontal membranes is the controlling factor, rather than muscular strength; and further, that in the chewing of food much more force is habitually exerted than is necessary.

The Chiffonniers of Paris.

Ragpickers' Town reminded me of some ancient, tumbledown fishing village, and certainly it was hard to realize that this was positively the city of Paris at the end of the nineteenth century. Space, it would seem, was at a premium in the Cité Doré, for utensils of different kinds ornamented the outside walls, and here and there a cradle swung lightly from its rusty nail. Many of the houses boasted of but one room, in which were, often, neither furniture nor bedding; a bundle of rags did duty for the latter, and in truth it was a case of rags, rags, raggedest of rags everywhere. The ragpickers were seated on their thresholds, or as near the door or apology for a window as it was possible to get. Here and there an ancient chiffonnière was patching together old remnants, but most of the men were classifying their merchandise spread upon the floor. These were the trieurs or sorters, whose business lay in dividing the odds and ends into their various classes before reselling them to the merchants en gros. The white rags had to be sorted from the colored, and the silk from the cotton or woolen. The woolen ones, I found, were prized the most, as they brought in nearly thirty francs the 100 kilos, while the silk were worth only seven. The chiffonniers collect over 50,000 francs' worth of pickings in one day (statistics of 1889), and nothing comes amiss to them.

I begged permission of an old chiffonnière to sketch her as she sat at her mending, and then the motley crowd, which had all the time followed closely at my heels, promptly surrounded me. The elders did not appear to view my movements with much favor at first, but their scowls were soon turned into broad grins by a general distribution of the cigarettes. The packet could not go all round, it is true, but it went far enough, at least, to make the inhabitants of the Cité my friends. They were a tough enough looking set, on the whole, but most of the older women appeared to suffer with inflammation of the eyes, and many of the children also—a thing easily to be accounted for by a glance at their grimy hands. Still the eye trouble was the only one which affected them very much apparently. Though irredeemably dirty, the children looked bright, happy, and healthful. And they had reason to, living as they were in an open quarter of low houses, where the sun could stream down on them and the air play around them—a sensation rarely to be experienced in the narrower Paris streets, where the immense height of the apartment houses keeps off, for the greater part, these two most important health factors. The young girls, too, had evidently their share of hardiness, and, with it, a sturdy independence of manner, not unbecoming the daughters of this liberty-loving race, and there were several quite pretty enough to warrant the existence of that romantic play of Bourgeois and Emery's, La fille du Chiffonnier, which created so much interest on the boards of the Ambigu a little while ago.

When I had made the round of the Cité, I attempted one or two sketches, and wherever I stopped, every window within sight would immediately become alive with heads partially obscured by the flapping rags which hung before most of the houses. I caught one old chiffonnière watching me complacently as she ate her supper, and called up to her to tell me, if she would, which was her quarter for collecting. She answered proudly, "The Opera," much to my surprise, for that part of Paris is five or six miles away. But I learnt that this neighborhood and the Chaussée d'Antin were the fat livings of the chiffonniers, and that a placeur will sell his right to empty the rubbish boxes of a few houses there for as much as 150 francs; for, although a coureur or roving chiffonnier's daily collection is seldom worth more than 1 franc 50 cents, that of the placeur, or chiffonnier with a regular situation, often amounts to seven or eight times that sum, and necessitates his bringing a hand or even a donkey cart.

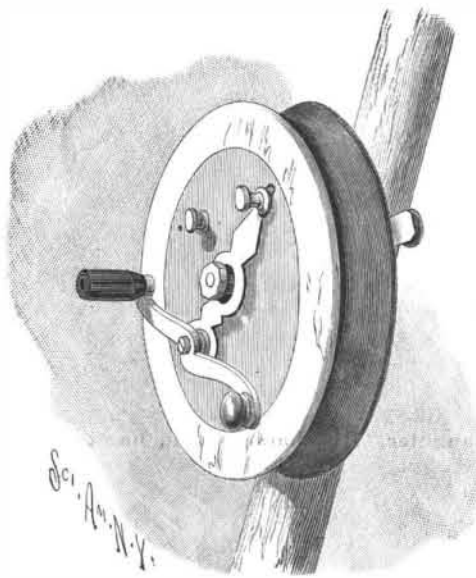
It is chiefly in suburbs such as Malakoff, Ivry, and Gennevilliers that the chiffonniers now congregate, though formerly they were to be found in Le Petit Mazas, Le Passage du Soleil, La Cité Maupy, and La Cité de la Femme en Culotte, which last, though now destroyed, once brought its eccentric landlady, Mademoiselle Foucault, 12,000 francs per annum. But it is the Cité Doré as the home of the chiffonniers which is of special interest, partly on account of the historic records in connection with it in the reports of "Commission des Logements insalubres" (1853), on account of the many controversies over it, notably in the Revue Municipale (1859-60) and because of the personal supervision still exercised over it by Monsieur Doré's daughter from her manor overlooking it. This was once the Château de Bellevue, which up till 1848 was surrounded by its park of 10,000 square meters. After that date, Monsieur Doré cut the ground up into little lots, and let it out to horticultural-loving Parisians at 5d. the meter per annum.

An enterprising chiffonnier not only rented one of these, but with the aid of sardine boxes filled with clay, bits of old building material and tin, built himself a hut. He was the envied of all the crowd of chiffonnier friends who came to wonder and admire, and

who were not long in following suit. They formed themselves into an independent republic to the number of 400, which by 1860 had increased to between two and three thousand. Until the speculators appeared upon the scene, the chiffonniers were thus their own landlords, which fact created in them that self-respect and independence which is not often found in others of a like class. Drink is their besetting sin, and it would seem that the fascinations of their special liquors, such as camphre, petit noir, fil en quatre, casse-poitrine, are not to be withstood. But though a liberty-loving race, these wild men and women of the outskirts are a peace-loving one too, and they are seldom in prison; yet from the beginning of their history they have been subjected to every kind of persecution. As early as 1698 they were forbidden by law to walk the streets before daybreak, and it is only since the Republic that the chiffonniers have been allowed to ply their trade without the once necessary adjuncts of government copper medal, certificate, basket, crochet (pronged stick), and lantern.—Englishwoman.

AN IMPROVED REEL.

The reel shown in the illustration is adapted to facilitate quickly throwing the gearing in or out of action, or retard the revolution of the pulley. It forms the subject of a patent issued to Thomas J. Halleck, of No. 506 West Thirty-ninth Street, New York City. From the plate fastened to the rod projects a pivot on which revolves the metallic hub of the pulley on which the line is reeled, the pulley having in its front face a recess closed by a disk on the forward end of the pivot, and the driving gear being located in the recess. On the



HALLECK'S FISHING REEL.

hub, in the recess, is a pinion engaged by a large gear wheel, whose shaft rotates in bearings on an arm that is adjustable on the front face of the disk, there being a handle on the outer end of the shaft, and the arm, which extends across the outer face of the disk, having at its center a larger recess for the outer end of the central pivot. On the opposite end of the arm is a knob and catch, the knob being connected with a spring disk, and, on lifting the knob, the arm may be pushed to move the bearing of the larger gear wheel, so that its gear will be out of mesh with the pinion on the pulley, the spring disk holding the arm in either position, as it may be placed. When the larger gear wheel is out of mesh with the pinion, the pulley is free to rotate loosely, permitting the line to unreel quickly for casting purposes, but such free rotation may be more or less checked, as desired, by a spring-pressed pawl, which also clicks on the pinion to give an alarm in case of a bite, or to prevent accidental unwinding. There is also a spring brake on the back side of the reel casing, to brake the pulley when casting.

Notable Engineering Achievements in the Great Lake Region.*

BY JOHN BIRKINBINE.

After exhibiting on the screen a map showing the proportions of the lakes as compared with Eastern States, and reference to the fact that three thousand vessels of total capacity of one and a quarter million tons float at elevations practically equivalent to the height of the statue of William Penn on the city hall tower in Philadelphia, the various methods of mining pursued in the region of Lake Superior were discussed. Starting with the preliminary log cabin, the first winch was illustrated, then the shaft, and finally the operating mine. Similarly, instances of the steam shovel and milling system of mining on the Mesabi Range of Minnesota; the deep underground exploitations of the hard iron ore mines of Michigan, and of the copper mines were referred to. A diagram was also presented, showing the great depth to which mining operations have been carried on, and the re-

* Abstracts from a paper read recently before the Engineers' Club of Philadelphia.

lation of these to ocean level and to that of Lake Superior. Views of hoisting and pumping machinery, methods of timbering, a timber squeeze, man engine, ore pockets at the mine, etc., were illustrated and referred to, a number of flash light views taken under ground by Prof. Denton, of the University of Minnesota, being part of the display. The docks from which ore is shipped, consisting of several hundred pockets with adjustable spouts, were described, and instances given where 2,500 tons of iron ore were deposited in a boat within forty-five minutes.

The "whale-backs," the steel canal boats, and other forms of vessels in use on the great lakes were discussed, and the facilities which they offer as means of transporting heavy freight referred to. The ore receiving docks on the lower lakes were then described. At these ore is handled from a vessel's hold after the buckets are loaded by stevedores, and conveyed several hundred feet back from the water for a cent or less per ton. The coal docks, both for shipping and receiving coal, and some of the special appliances were noticed.

In the matter of harbor improvements, special attention was given to the artificial entry to the harbor of Duluth and of the new breakwater at Marquette. The latter is a series of "beton" blocks, each about 100 tons in weight, formed in place, but leaving alternate spaces of 10 feet between each block, which was subsequently filled in by similar blocks, this being done to prevent any local settlement disturbing more than one 10 foot section. The enormous shipment through St. Mary ship canal was said to have been 13,000,000 tons in the eight months in which navigation was open in 1894, and it will probably approximate 17,000,000 tons the present year. The statement was also made that the average distance the freight was carried by water was over 800 miles, and the cost slightly less than 1 mill per ton-mile. The growth of this canal was demonstrated by the fact that although in 1856 a lock 350 feet long, 60 feet wide and 12 feet deep was considered ample for a century, by persons then well versed in local progress, in 1880 a new lock, 515 feet long by 80 feet wide and 16 feet deep, was opened, and the congestion was so great in 1894 with this canal that the average detention of vessels was over seven hours. A new lock, 800 by 100 feet and 20 feet deep, is now practically ready for service on the American side, while another lock on the Canadian side, 900 by 60 feet, will help relieve the congestion. These locks are to overcome the difference of level between Lake Superior and Lakes Michigan and Huron.

The Chicago drainage canal was then liberally illustrated, and facts concerning the 40,000,000 cubic yards of material handled were given. Among these was the average cost of rock excavation at 76 cents and dirt 22 to 28 cents per cubic yard. The material was largely handled, after the top lift had been removed, by means of cantilevers, cable-ways or swing derricks, which met with favor in the order named—a cantilever costing, however, about \$28,000, while a cable-way cost but about \$12,000. Few of the contracting firms owned their conveying apparatus, most of the work being sublet to conveyor companies. Drills which have bored from 90 to 130 feet per day in the limestone rock through which the canal is cut could penetrate but from 6 to 20 feet in the harder Lake Superior iron ores.

The propeller pump used at Milwaukee to flush the river by delivering about 40,000 cubic feet of water per minute was illustrated. The improved methods of constructing vessels for the lake traffic and the unique way of launching them sideways also received attention and illustration.

The railroad tunnel under the St. Clair River was shown in section and the statement made that during the season of navigation a greater tonnage passed through the St. Clair River than elsewhere in this continent.

The paper closed with a reference to the improvements at Niagara, and a statement that the engineering features of Lake Ontario and the canal between Lake Erie and Lake Ontario had necessarily been omitted to make the description complete so far as the upper lakes were concerned, although it was not claimed that all of the remarkable achievements of the engineer had been mentioned.

At the close of Mr. Birkinbine's remarks there was some discussion on the temperature of deep mines, and in answer to a question the statement was made that with fair ventilation it need not be uncomfortably warm. In some mines water found at a depth of about 1,500 feet is quite salt, and at a greater depth becomes acrid. Large masses of pure copper are often mined, sometimes with pure silver attached to them. The Quincy mine was cited as having yielded masses that were cut down to pieces weighing 10 tons so as to be put into the furnace.

SIXTEEN new steamers of the largest class for passenger and freight business have been contracted for by the owners of the principal lines of steamers plying between New York and European ports.