are without doubt the largest engines ever constructed. Her paddle wheels are fifty feet in diameter. Her saloon is lofty, of great size, and most luxurious in its appointments.

Although built for a passenger and freight steamer, and intended for the Australian trade, she has been used almost altogether in laying submarine telegraphs, proving altogether too large for profitable use as a merchant steamer. There is no doubt, in the event of Great Britain's going to war, she would be used as a transport steamer, being able to accommodate 10,000 soldiers with their baggage. Any one who has read Jules Verne's "Floating City" has a pretty correct idea of her vastness.

Domestic vs. Imported Broadcloth.

The question, why American woolen mills cannot produce as good cloth as the imported, is just now receiving considerable attention, and, as carriage builders are obliged to use imported cloths on all their best carriages, we have taken a lively interest in the subject. In procuring information as to why broadcloth cannot be made in America of a quality suitable for trimming our best carriages, we have conversed with several persons capable of imparting valuable information, with the following result: We were told by a gentleman who deals extensively in carriage goods, both foreign and domestic, that the American looms can produce just as good broadcloth as foreign, provided the same wool is used and the same care exercised as there is in cloth of foreign manufacture. This gentleman stated that the wool used in the best foreign cloths is of Australian production, while our domestic wool is inferior as regards length and quality. Imported wool cannot be used in the manufacture of cloth in this country, because the high duties on the raw material make the price of the cloth much higher than the imported can be bought for. There is another reason why domestic cloth is not as good as foreign, the blame for which must be attributed to negligence on the part of our mill owners. The cloth, after being woven, is not entirely cleansed or scoured of its accumulation of grease.

In conversation with a superintendent of a woolen mill in this city (and also inventor of a number of improvements connected with looms) who is familiar with the manufacture of woolen goods both in Europe and America, we were informed that although the Australian wool was longer and of better texture than our domestic, yet it is not necessary that it should be used for the manufacture of good cloths. Long wool is not required, short wool being the best. We therefore have domestic wool that is just as good for all purposes in manufacturing broadcloths as the Australian. One great trouble is on account of the limited capital of our mill owners, which prevents them from keeping a large and full assortment of different grades of wool in stock. Another, and the principal reason, is the great haste which is practiced in the finishing. On this account, the cloths are no sooner out of the looms than they are placed on the market. How detrimental this haste is to the goods will be more easily comprehended when the process of finishing is understood. In manufacturing broadcloths, the wool is first cleansed of all gum or animal fat, and is then oiled with lard or olive oil in order to be spun. In the process of weaving, more or less grease gets on it from the belts and machinery. After the cloth comes from the loom, it is run through scouring machines, in order to remove this oil and grease. In Europe this is done thoroughly, while in America so much care is not observed; therefore, the great objection to the use of American broadcloths for carriages consists in this neglect to remove all foreign matter, consequently the cloth catches the dirt more readily.

The trimming of any carriage is subjected to the most severe usage. It is exposed to the dust and dirt which accumulates upon it while driving in the streets, and which is ground into the cloth by the occupants and set by the action of the atmosphere. When a cloth is used possessing the deleterious qualities attributed to that of American make on account of imperfect scouring, it shows very quickly the presence of foreign matter that should have been removed before it was placed on the market. Could the trimming of a carriage be removed at will, and cleaned with little expense, the ill effects of imperfect scouring could, to some extent, be overcome; but when, as is the case, the cloth once placed must remain in position until worn out, or—in rare instances in these times of quick production—is removed to be replaced by new material, it is important that a cloth should be used that is entirely free from these defects.

Not many years ago our carriage builders were unable to procure an American make of varnish good enough for finishing. Now some American makes of varnish are unsurpassed, and even find a ready sale in London and Paris. The obstacles to the accomplishment of this were by far more difficult to surmount than those which hinder the production of good American broadcloths. Our looms and machinery are far superior to those used in Europe. We cannot pronounce our operatives less intelligent or lacking in skill. Then why should not this one hinderance in the manufacture of broadcloth be overcome by the proprietors of woolen mills, by placing in the market a broadcloth made from domestic wool, with American machinery and by American operatives, that shall be sufficiently good for the trimming of our best carriages?—*The Carriage Monthly.*

A NEW VEHICLE.

To the Editor of the Scientific American:

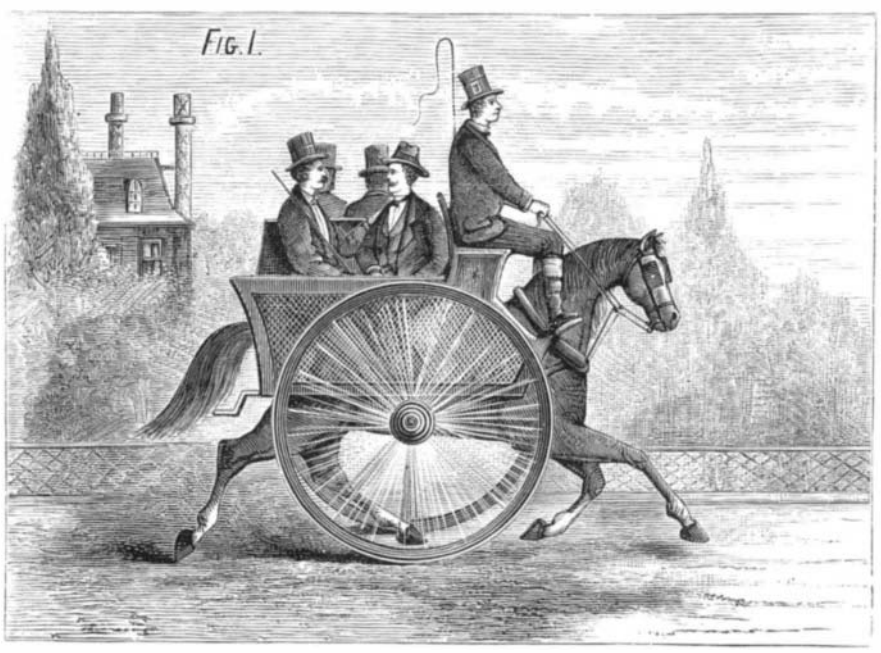
In these days of new rigs for ships there would seem to be no valid reason for not having something new for perambulating our parks. Mail coaches driven by their owners and tandems and double teams are expensive; they require showy horses and costly harness, and, last, not least, they require much space in which to navigate them. The vehicle I illustrate is eminently well adapted to these hard times, when our pockets and our patience are to be worn out by silver dollars worth only 90 cents. It carries four persons, besides the driver; it is compact, easy of draught, turns in the length of the horse, gives full control over him, is easy of access, makes no dust to annoy unless the wind be aft and the horse too slow to get away from it; is of cheap construction; requires very little showy harness, beyond the head stall; it protects the horse from rain, sun, and flies; if the horse falls you are no worse off than if he fell in a chaise or a dog cart; and last, not least, almost any horse will do, provided he has good legs, a fair tail, and good wind.

Fig. 2.

THE "EQUIBUS"—REAR VIEW.

The vehicle may be made so that the passengers can sit in several different positions, first as shown in the drawing, back to back, as in an "inside jaunting car;" or they can all sit with their faces to the front; or two can sit facing aft and two facing forward, the first two getting in from the rear, and the others climbing up over the hub and wheel. One great advantage consists in taking hold of the load close to the collar; another prominent advantage is in the near proximity of the driver to the horse, whereby he can talk to him in a whisper, and pat him gently if he shows any signs of not liking his load. If the horse should manifest any mutinous spirit, he can neither rear nor kick to do any damage. All that will be required to make this the safest of all vehicles, after the hearse or the wheelbarrow, will be to balance the load so as to bear gently on the fore quarters or back, as in a chaise or two wheel dog cart. In crowded thoroughfares it will have no rival; the "gamins" of the street may pelt you and stand little chance of hitting the horse. To convert it into a sleigh you have only to chock your wheels and shoe them with short runners; but we are not recommending this vehicle for winter or for rough country roads. The saving to the community at large may be estimated by millions.

Fig. 1.



THE "EQUIBUS"—SIDE VIEW.

I estimate the cost of a dog cart at $500; a handsome 16 hand horse, $400, a nice Baker harness, $100; total, $1,000. My vehicle will cost about $250; my horse, say, about $150; my harness, $30; saving $570.

Now it is quite clear to my mind that all the Vanderbilts, Belmonts, Jeromes, Kanes, Camerons, Bonners, Purdys, and men of that sort who can afford it, as also many who cannot afford it, will want this vehicle, besides the vast crowd of speculators, jockeys, savings bank officers, and lobby members; so that at least ten million people of this demonetized nation will each save at least $500, making a round sum of —well, enough to pay off the national debt in silver coin. There will be a sad falling off in the price of horses and leather, and some of the fashionable carriage makers will have to go to the wall. But, take it all in all, this contrivance must be placed beside the invention of the telegraph, the telephone, the steam engine, the propeller, the monitor, and the double topsail rig for ships, which, though mentioned last, stands to-day among the most useful and humane inventions of the age. I have forgotten to allude to wages in connection with the what-shall-I-call-it; as the appearance of the horse will go for nothing, one man can take care of any number of heads and tails, and as owners will always want to drive themselves, no real coachman in drab coat and big brass buttons will be required. This will add another million or two to the general economy, to which this age seems to be rapidly and necessarily approaching.

EQUIBUS.

P. S.—Won't that be a good name for it?

New Inventions.

Mr. Chas. Jansen, of New York city, has invented a Vapor Bath adapted in shape to the entire body or any part, and constructed of outer closed and interior perforated walls, forming compartments to which steam is supplied by pipes.

Mr. Daniel Williams, of West Philadelphia, Pa., has invented a Funnel intended for use in filling opaque vessels, and arranged so as to prevent the liquid from running over or spilling when removing the funnel. A tapering plug, carried on a rod, which is operated by a journaled crank and handle, fits in the nozzle, and closes it when the vessel is shown to be filled by the liquid ceasing to flow. A second external nozzle forms an air space, allowing the air from the vessel to escape.

A new Burglar Alarm, operated by turning a knob or opening a door, has been invented by Mr. August Beck, of New York city. It consists of a ratchet wheel which engages a bell hammer, and is acted upon by two pawls, one moved by turning the door knob and the other by a spring released on opening the door.

Mr. Edwin Harkness, of Vincennes, Ind., has invented an improved Vault for burial purposes, which is made of concrete laid over a sheet iron or wooden form containing the casket; and a modification of this invention is a sheet metal vault, which protects the casket, and may be bedded in concrete or not, as desired.

An improved Gate Latch, which is capable of being adjusted to accommodate the sag of the gate, has been invented by Mr. W. F. Golden, of Morris, Ind. The catch pin is carried by a long and narrow base plate, slotted with a number of countersunk holes for receiving the screws, and may be raised or lowered, as circumstances may require.

Mr. W. M. Rich, of Rome, N. Y., has invented a handy Molasses Sampling Glass for exhibiting and testing samples of molasses and sirup, at the same time keeping the contents free from dust. It is a glass vessel having a funnel-shaped top, with symmetrically hinged cover-sections, through a recess of which a spatula is introduced.

An improved Fence Post, invented by Mr. D. C. Johnson, of New Providence, N. J., is intended for wire fences. The post is made of malleable iron, having divergent limbs or braces and a horizontal cross bar, all welded together and set in a solid base piece.

A Toy Revolver, designed to use paper percussion caps, and of very simple construction, has been patented by Messrs. August Dahler and F. W. Hoffmann, of New York city.

An Outside Window Blind of novel construction, which may also be extended so as to form an awning, has been invented by Mr. James Hester, of Knoxville, Ill. The blind is made of canvas or similar fabric, held in a frame and wound up on a roller, the lower part of the frame being hinged and connected by folding side sections to the casing, and having pivoted brace rods to throw it out as an awning.

Mr. S. T. Sanford, of Norton, Mass., has patented a Fastening for Shoes, formed by the interlacing of two pieces of leather slotted to form alternate strips and spaces, arranged with the strips of one piece passing through the spaces of the other, and formed upon or secured to opposite sides of the opening; the pointed ends of these pieces being secured by loops to a button placed in such position as to draw the parts snugly together.

An improved Rotary Valve for Brass Musical Instruments, which substitutes a positive action for the string mechanism in common use, has been invented by Dr. Theodore Artaud, of Jackson, Miss. The keys are acted on by springs, and operate curved arms having fixed pins which work in slotted levers directly connected to the rotary valves.

Mr. H. V. Caton, of Patricksburg, Ind., has made an improvement in the Running Gear of Wagons, designed to prevent straining and twisting when passing over uneven roads. The reach is made in two parts, having flanges at their connecting ends, and secured by bolts working in slots which permit a limited rotary movement of the forward part without twisting the other. The perch block is cast in one piece with the fifth wheel, thus preventing rattling.

Mr. R. B. Eason, of New York city, has made certain improvements on patent No. 193,858, previously issued to him, for a Car Axle Box, which relate to the arrangement of the oil chamber. This is hinged, and has a bottom perforation and sliding valve surrounded by a concave dishing to prevent leakage, and is provided with a spring clasp to secure it in closed position against the casing of the axle box.

A new Side Bar Wagon of simple construction has been patented by Messrs. William H. and Warren H. Colby, of Merrimacport, Mass. The side springs are pivoted at their forward ends to clamps rigidly attached to a rock shaft extending across the wagon, in combination with clips and butt springs so arranged as to resist pressure simultaneously and thus obviate jolting.

Mr. Albert Hall, of Cypress Hill, N. Y., has patented a Lamp Extinguisher, which is made distinct from the burner and of different sizes, so as to be applicable to any lamp. It consists of a slide placed over the wick tube, and having a lever cap or cut off, which is operated by a string passed through one of the holes in the bottom plate of the burner.

Homesickness as a Disease.

The last published volume of the *Dict. de Médecine* has an interesting article on nostalgia, by Dr. H. Rey. He regards it as a form of insanity. It is not often observed in childhood nor in advanced age, and is much less frequent in women than in men. It is most common in the young conscript drawn from the country, who enters the infantry; the town lad is too much accustomed to change and the bustle of life; while the cavalry soldier is too much occupied to have time to think over his separation from the place where his affections are centered. M. Rey states that the men of Bretagne are most liable to homesickness, as many cases occurring in those from this district as from the whole of the rest of France put together. The symptoms of nostalgia are, that the patient becomes sad and taciturn, forbears to eat, retires to weep alone, and gives himself up to long reveries of home. After a time, if he goes beyond this first stage, he begins to bear the aspect of ill health, and suffers from headache and sleeplessness; and if the disease still advances, delirium, prostration, diarrhea, and marasmus come on, terminating in death. Sometimes, he says, even old soldiers do not escape the malady. It is in hard times that this occurs, when fighting has to be done in retreat, and when other troubles are added to the bitterness of defeat; when he feels himself forsaken; when he is exposed to cold, is hungry, has to sleep on damp soil, and is suffering frightful thirst from his wounds; perhaps is taken prisoner, or droops under the diseases that spring from misery—scurvy, typhus, or dysentery; under these circumstances, the remembrance of the country he has left behind him, of the mother, the wife, or the home, awakens and brings a tear into the eyes of the bravest.

Catalpa Railway Ties and Telegraph Poles.

Mr. E. E. Barney, of Dayton, Ohio, gives, in a recent pamphlet, much interesting information in regard to the cultivation of this tree. The wood has a capacity to resist decay, especially when buried or in contact with the earth, that is almost marvelous. Fence posts made of it, that have stood in the ground 46 years, have been taken up and show no signs of decay; and we have a specimen of the wood taken from a post that has been standing two feet in the ground for 75 years. The specimen is perfectly hard and sound and is beautifully polished. The part of the post that was in the ground was decayed about a quarter of its diameter, the remainder being as sound as ever. The wood is light in weight, of compact fiber, has a handsome grain, takes a brilliant polish, and is well suited for ornamental cabinet work. Trees of four years' growth have no sap, and the older ones but a mere film, hardly thicker than paper. They are indigenous in Indiana and other parts of the West, where specimens may be found four feet in diameter next the ground, and with trunks of fifty feet without a limb. This size, however, is much greater than the average. It is very prolific and has a rapid growth, and these peculiarities would doubtless be more fully developed under favorable conditions of cultivation.

A tree large enough for four railroad ties can be grown from the seed in twenty years. They should be planted thickly so as to confine the growth to the trunk, and after a certain period thinned out by transplanting or otherwise. A general manager of one of the Western roads will plant 640 acres this year with catalpa for future railway ties, and from experience thus far, Mr. Barney is of opinion that with proper effort, a road may in 20 or 30 years grow ties enough for its own use, and at the same time thin out and sell enough of the smaller growths for telegraph poles, fencing, and other purposes, to cover all expenses of growing and manufacturing the ties. There are, of course, no complete tests of the lasting qualities of this wood in the position and service of ties. Thirty or forty years would be required for that. The durable nature of the wood, however, is beyond dispute; and from experiments made thus far, the catalpa ties are as firm under the rails as oak, and hold spikes equally well. It is claimed by Mr. Barney that a railroad once laid with them would require no renewals, to speak of, for fifty years, and that its annual outlay for repairs would be diminished $200 per mile, a saving that would add ten per cent to the value of the property.—*National Car Builder.*

FRENCH BAND SAW BLADES.

The band saw blade is a ribbon of steel, the usual length being from fifteen to forty feet, and from ⅛ to 4 inches wide. Its chief requisites are uniformity of temper, width, and thickness, a perfect joint, and freedom from all flaws.

Blades are liable to break from crystallization, imperfect tension, or carelessness of the operator in handling, and as a certain degree of temper is required for springs made of fine steel, so is the same temper necessary in band saw blades to insure durability and efficiency. To secure a uniform temper in a blade of steel from fifteen to forty feet long re-

quires careful manipulation. The appearance of a band saw blade does not indicate its temper, and it is difficult to distinguish tempered from untempered saws. A soft saw is comparatively worthless, as it will not retain its cutting edge. The best and surest test is to bend the saw or blade, and see if the elasticity indicates temper. The blades patented and manufactured by Messrs. Perin, Panhard & Co., of Paris, France, we are informed, are not injured by this test, but with proper handling prove to be durable and efficient. Further information respecting them may be obtained from J. A. Fay & Co., of Cincinnati, Ohio. See advertisement in another column.

The Tests of Magazine Guns at Springfield Armory.

The attention of inventors of magazine small-arms is directed to the competitive tests of these weapons in progress at the National Armory at Springfield, Mass. We are indebted to Lt.-Col. Benton for a copy of the following regulations governing the trials, to which all guns submitted will be subjected.

The regular tests are as follows:

FOR SAFETY.—The piece to be fired ten rounds by the exhibitor, or with a lanyard.

TO DETERMINE RAPIDITY WITH ACCURACY.—The number of shots will be noted, which, fired in two minutes from the gun—both as a magazine gun and as a single shooter—strike a target 6 feet by 2 feet at a distance of 100 feet.

FOR RAPIDITY AT WILL alone record will be made of the number of shots which can be fired in one minute, irrespective of aim, under the same circumstances as above noted.

TO TEST FOR ENDURANCE.—Each gun will be fired 500 continuous rounds without cleaning, using the magazine. The state of the breech mechanism will be examined at the end of every 50 rounds.

Each gun will be fired once with each of the following defective cartridges: 1. Cross-filed on head to nearly the thickness of the metal. 2. Cut at intervals around the rim. 3. With a longitudinal cut the whole length of the cartridge, from the rim up. A fresh piece of white paper, marked with the number of the gun, being laid over the breech to observe the escape of gas, if any occur.

TO NOTE EFFECT OF DUST.—The piece will be exposed in the box prepared for that purpose to a blast of fine sand-dust for two minutes. It will then be removed, fired 20 rounds, replaced for two minutes, removed, and fired 20 rounds more.

The rust test is as follows: The breech mechanism and receiver to be cleansed of grease, and the chamber of the barrel greased and plugged, the butt of the gun to be inserted to the height of the chamber in a solution of sal-ammoniac for ten minutes, exposed for two days to the open air, standing in a rack, and then fired 20 rounds.

Lastly, each gun will be fired once with 85 grains of powder and one ball of 405 grains of lead; once with 90 grains and one ball, and once with 90 grains and two balls. The piece will be closely examined after each discharge.

Those arms which successfully withstand the above will then be subjected to the following supplementary tests:

First. To be fired with two defective cartridges, Nos. 1 and 2, and then to be dusted five minutes, the mechanism being in the mouth of the blow-pipe, and closed, the hammer being at half-cock; then to be fired 6 shots, the last two defective, Nos. 1 and 2; then, without cleaning, to be dusted with the breech open, and fired 4 shots. The piece to be freed from dust only by pounding or wiping with the bare hand.

Second. To be rusted for four days after immersion, as before, and then fired 5 rounds with the service-cartridge; then, without cleaning, to be fired 5 rounds with 120 grains of powder and a ball weighing 1,200 grains; the gun to stand twenty-four hours after firing without cleaning, and then to be thoroughly examined.

Third. Facility of manipulation by members of the Board.

Fourth. Liability to accidental explosions of cartridges in the magazine.

Additional tests may be made by the Board to clear up doubts raised by previous trials.

Shoddy Leather.

It is probable that many persons have never heard of "shoddy leather," but it exists, and some who doubt it may perhaps have occasion to question their own *understandings*, or at least their *soles*. A few years since, a mode was devised of coarsely grinding new leather clippings, and, after forming it into a pasty mass, reducing it to dry, firm sheets of sole leather by hydraulic pressure. This article is considerably used in New England, especially for the interior portion of soles of the cheaper grades of boots and shoes; but we believe that these are not always sold on their own merits with the knowledge of the buyer. So, from this curious discovery, we have another evidence of the frugality of the arts in great saving of material formerly wasted—another stepping stone to the rise of manufacturers, merchants, and brokers to competency and wealth, and the employment and elevation in condition of thousands of working people—many of the latter becoming factory owners and men of large wealth. Let no one, therefore, be anxious to apply the term "shoddy" as a reproach, especially since the first cause for its epithetic use has long since departed. It is not wise to despise anything which has a probability of usefulness in the arts, nor to consider any business derogatory which aids to enrich the world, and contributes to the advancement and comfort of society.—*Am. Exch. and Review.*

Heat and Muscular Energy.

Professor A. Fick, of Wurzburg, has recently conducted a series of important experiments on the source of muscular power. The results he has obtained are very remarkable as showing the economy of the human machine, which after all is nothing but a form of heat engine. Helmholtz, it may be remembered, calculated some years ago that about one fifth only of the total work yielded by the chemical reactions going on in the human body reappeared in muscular action, while the remaining four fifths was manifested as sensible heat. It follows from this that a much larger proportion than one fifth of the work yielded by chemical force in the muscle itself can be employed in overcoming mechanical resistance, inasmuch as it is assumed that a great part of the oxidation takes place in other tissues, where mechanical work is out of the question and where heat alone can be the result.

Professor Fick's researches have been made with a view of determining what fraction of chemical force eliminated in the muscle is used in mechanical work, and he has measured in the muscles of the frog the mechanical work performed by the muscle, and the amount of chemical work that the muscle has yielded during the action. By means of a thermo-pile introduced between muscular masses, he found it possible to determine with great accuracy the absolute amount of heat produced by their contraction. To the fundamental law of Heidenhain, that a muscle contracting to its greatest extent evolves more heat the greater its initial tension, we may now add that, with equal initial tension, a muscle will evolve more heat if, by means of weights in equilibrium, greater tension be produced during the contraction. A muscle overcoming greater resistance works not only with more activity, but also with more economy than when occupied by a smaller effort. In an energetic muscular contraction, against as great a resistance as possible, the eliminated chemical force is about four times as great as the mechanical work it performs. With a less resistance the chemical is a greater multiple of the mechanical force, and with no resistance at all it is obviously indefinitely greater. The amount of heat produced by the eliminated force in an energetic contraction of 1 gramme of untried frog's muscle is sufficient to raise 3 milligrammes of water from 0° to 1° C. By adopting some very probable assumptions it can be inferred that the combustion of assimilated food, as far as the oxygen inspired is employed in producing chemical force, takes place almost exclusively in the muscular tissues.

Pigeon Living after the Removal of nearly all the Brain.

Dr. McQuillen describes the case of the extirpation of nearly all of the cerebrum of a pigeon by himself, and desires to place on record the fact that the subject not only survived the operation twenty-four days, but gradually regained its usual powers and habits of flight and its ability to feed itself and drink.

Only one such case is on record. He argues for the propriety and usefulness of such operations from the acknowledged existing uncertainties of the science.—*Proceedings American Philosophical Society.*

Fast Steamboats.

Several torpedo boats, of private manufacture, made trial trips on the Thames during February, and attained the extraordinary speed of 27 knots an hour, which is about the speed which is now attained by the fish torpedoes at the Royal Arsenal. This speed, which means range and precision as well as a saving of time, is three knots faster than that of any other torpedo yet produced.

A 20 lb. Salmon in a Halibut's Stomach.

A Wick (England) fishing boat landed a fine conditioned halibut, weighing 187 pounds, measuring 6 feet 8 inches in length, and about the same in girth. On opening the fish its stomach was found to contain a fine salmon in very good condition, and which weighed 20 pounds. The fisherman remarked that it was no wonder the halibut looked so well, seeing the sort of dinners he indulged in.