

tion of the new motor, which is about to contest the supremacy of the steam locomotive under conditions which will provide "a fair field and no favor." Judging from the results obtained with the Hardie motors which are running on the lines of the Third Avenue company in this city, it is reasonable to expect that the new motor will not suffer in the comparison. The first two of these cars, which were put in service on August 3, 1896, have now run about 20,000 miles and carried 125,000 passengers. During the heaviest snow storm of this winter they ran 153 miles on time, their service comparing favorably with that of the cable cars.

How far the same efficiency can be shown by the heavier motors, and how far they can show superior economy to the steam locomotive, will now be determined by a lengthy and careful test.

**The Niger Exploring Expedition.**

After an absence of three years, the expedition under Lieut. Hourst has safely returned to Europe from the Niger, says Nature. The party ascended the Senegal River, and then carried the section of an aluminum boat overland to the upper part of the Niger. On reaching this river the pieces of the boat were put together, and two native boats purchased. In these the expedition sailed down the Niger to Timbuctoo, where a stay of ten months was made. The voyage from Timbuctoo to Lokoja, at the confluence of the Niger and Benue, seems to have been arduous, but from that point the expedition was towed by a launch belonging to the Royal Niger Company to the coast at Wari. How much fresh topographical information Lieut. Hourst's party has obtained is not yet stated; this will depend on the highest point reached on the Niger. Reuter's message states that the expedition "first met the river Niger at Kayes;" but that town is on the Senegal River. There can be no doubt, however, that much valuable scientific information was obtained, for the expedition traveled slowly and was admirably equipped. One novelty was the use of a phonograph for reporting the native war songs. The expedition kept peace with the natives throughout the journey, in which it differs greatly from some of those previously conducted by French explorers in that region.

**Raising a Draw-bridge by Wedges.**

A novel piece of engineering was done in Chicago on October 25, says the Railway Review, which was watched with much interest by civil and railroad engineers. The bridge over Clark Street was raised for the purpose of inserting new casters in the place of the old ones, which were so much worn down as to be at least two inches too small. Assistant City Engineer Roemheld, who had the work in charge, used a series of wedges in place of raising the structure by means of jack screws. The experiment proved an entire success. There were eighty of the old casters to be removed. The old system would have required that the bridge be lifted on jackscrews, so that all the casters could be taken out at the same time and the new ones put in their places. By the new method the work was greatly simplified and shortened. The casters were so close together that it was im-

possible to place wedges between them which would be long enough to reach the required height at their thicker ends, unless the angle of the incline should be too great for the power of the bridge engine. To overcome this difficulty, applying the principle of inclined plane, Mr. Roemheld made his wedges in sections. Those used recently were in four parts, each about eighteen

inches in length. The thinner sections of wedges were placed first in front of six of the old casters, separated at such intervals as to distribute the weight of the structure in the right proportion. Then the bridge was made to revolve, the six casters rose on the wedges and lifted the bridge free from the remainder of the old casters. When these had been taken away, there was room for laying the remaining sections of the wedges one after another, until the elevation of the bridge was sufficient to allow the placing of the new casters. When all the new casters had been placed for which there was room, the next move was to lower the bridge so that its weight would rest on the new rollers, relieving the six old ones that had done extra service, so that they might be removed. A crew of twenty men,

under the supervision of Mr. Roemheld, worked through the daylight hours in changing the casters. Under the old system of work, it is estimated that the change could not have been effected in less than three days, and it would have required the erection of timber false work to accomplish it. In the work as done, not a stick of timber was used.

**CAPTURE OF A FIFTY FOOT WHALE IN PUGET SOUND, WASHINGTON.**

Despite the multiplied number of subjects which are being gathered day by day within the field of the photographer's industrious and ever ready camera, there are some which even the omnipresent "Kodak" and its kind have failed to secure except on rare occasions.

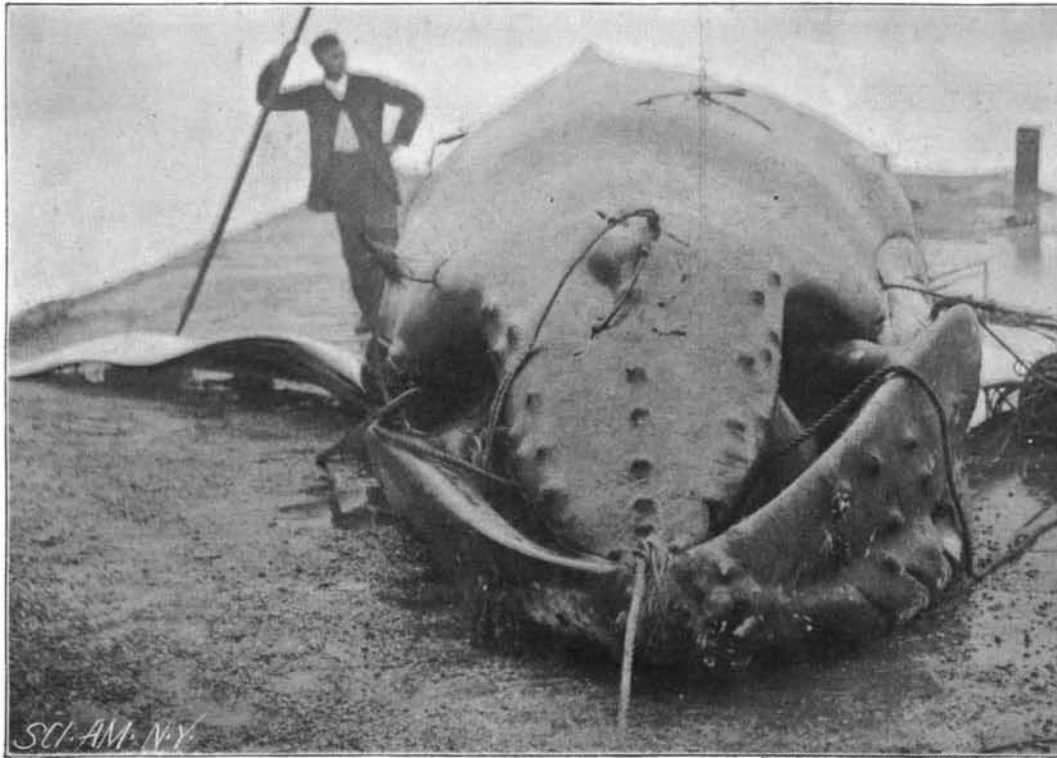
Of such an exceptional sort, surely, are the photographs of a newly captured whale from which the engravings which accompany the present article have been made. They were taken and forwarded to this office by Mr. William E. Crain, of Tacoma, Washington, shortly after the whale had been towed ashore, and it is probable that the engraving, which shows the huge mammal with its mouth opened, revealing the long hairlike fringe of the baleen or whalebone blades, is the first of its kind ever produced.

Not without much toil and frequent misgiving was the monster captured, for the hunters were inexperienced and the weapons inadequate, at least so it would appear from the local accounts of the hunt, which seems to have occupied, from the time the first assault was made to the hour at which the whale was finally moored in the harbor, just one week. The capture was mainly due to the efforts of four men in two small boats, who drove the first

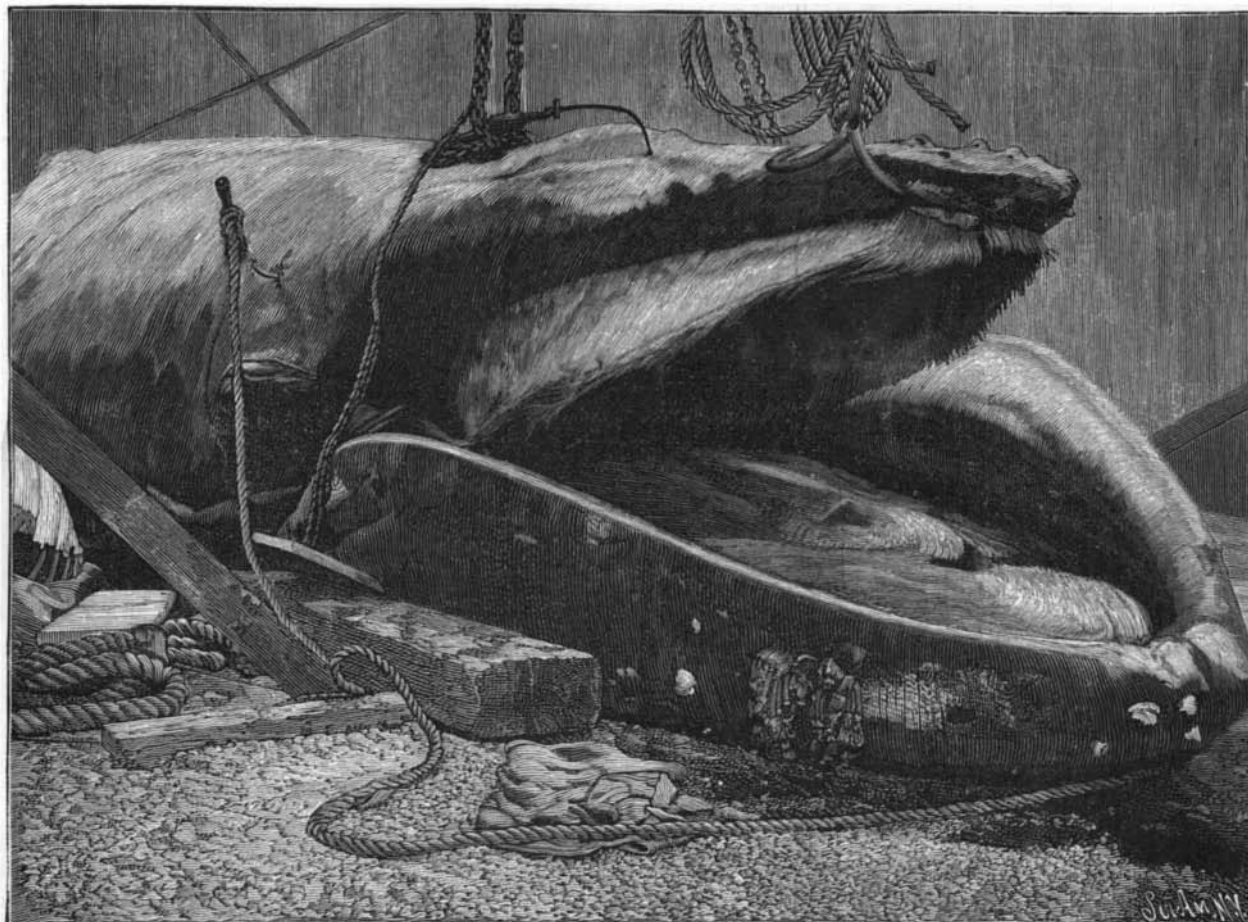
harpoon near the dorsal fin—not a fatal nor even a dangerous spot, as may be judged by the fact that they were towed for hours without the mammal being sensibly affected. They implanted other harpoons with little effect, and were subsequently joined by a small screw steamer which had rigged up a cannon on its bows for firing the harpoon. With this weapon a fatal shot was fired, the harpoon entering near the heart. It was estimated by the first captors that their boat was towed in all fully two hundred miles, and as the whale appears to have been moving constantly up and down the waters of Puget Sound for a whole week, the estimate is probably not exaggerated. The final effort in which the boats closed in on the whale is thus described by one of the hunters: "His only object

seemed to be to evade his pursuers. This evasive work alone made the fight hazardous to us. With a mighty spout of water he would fluke and dive beneath the steamer, and rise upon the opposite side. We were in constant fear lest he might scratch his back on the hull and demolish the craft. When charged upon the starboard side of the boat, he would sound lightly and bob up serenely on the port side. Once in a while he would remain down a few minutes as if playing hide-and-seek, and then saucily show his dorsal fin astern, or ahead, and send up a rainbow of water as though waving a flag of defiance. The boats were not once attacked, and he would always maneuver to find a way to come up in open space, although he manifested no disposition to run straight

away and beat a full retreat." The photographs, which were taken after the whale had been towed to the shore and beached, give a remarkably clear impression of one of these most remarkable of all creatures. All three engravings show it in the position it would occupy in the water, and not upon its back, as the curious appearance of the mouth might suggest to



FRONT VIEW OF FIFTY FOOT WHALE CAPTURED IN PUGET SOUND, WASHINGTON, SHOWING THE FORMATION OF UPPER AND LOWER JAWS.



HEAD OF WHALE, SHOWING CAVITY OF THE MOUTH, WITH THE WHALEBONE BLADES AND FRINGE ON THE UPPER JAW.

those who are not familiar with the appearance of a whale.

The approximate measurements were as follows: Length over all, 50 feet; width of tail, 10 feet; thickness through the body, 12 feet; length of jaw, 17 feet. The captors believed that he was one of the rorqual species, which is said to be common on the Pacific coast, and to have a habit of entering inland waters; but, judging from the photographs, it seems to bear more of the characteristics of the humpbacked whale, so called by whalers on account of the peculiar shape of the dorsal fin. This species is distinguished also by the great length of the pectoral fins, and the fact that while the body is black, these fins are white, both of which characteristics are present in this specimen, as will be seen in the front view, which shows these fins extended. It is true the rorqual has the skin of the throat and underbody seamed with deep longitudinal furrows, but this is also a mark of the humpbacked whale, and is present in this specimen. These furrows appear on the fold of skin which in the engraving is seen pressed out under the left side of the lower jaw. Further marks that establish its species are the comparatively shallow upper jaw and the peculiar knoblike swellings which ornament or disfigure it.

The most interesting engraving is the wood cut which shows the interior of the mouth. The upper jaw is provided with a continuous row of closely packed whalebone blades, which are pendent from the roof of the mouth, and terminate in fine, long, brushlike ends. When the mouth is closed the fringed ends of the whalebone lie in the channel-like space between the tongue and the sides of the lower jaw.

These act as a strainer when the mouth is open, and serve to retain the crustaceans and small organisms which form the food of these fish. The mouth is first filled with water, and then, as it is closed, the water flows through this natural sieve, leaving the nutritious matter behind. The expulsion of the water is completed by the raising of the tongue, which lies within the deep cavity of the lower jaw, against the roof of the mouth.

It should be stated that when the whale was being towed to the harbor it made a desperate resistance, and a veritable tug of war occurred between whale power and steam power, in which for a while the boat was held stationary. A glance at the huge tail and broad fins accounts for the high speed which the whale attains, and it is interesting to note that the flukes of the tail are very similar in shape to the latest type of propeller blades on a modern steamer.

**THE BRAMBEL ROTARY ENGINE.**

Last November the press of the country was informed by special telegrams that Mr. Grant Brambel of Sleepy Eye, Minn., had invented and patented a rotary engine for which he was offered at that time £320,000 (\$1,600,000) from an "English syndicate." It was reported that the whole amount of the purchase money was paid over in cash and deposited in Chicago banks by the inventor. There are a number of variations of the story, of which the following is an example, the clipping being taken from the Chicago Daily Tribune:

"The engine does away entirely with the crank motion of the steam engine, a most desirable, but to all intents and purposes an impossible thing to do. The engine uses its own

plunger for a cutoff. The engine is steam tight, and requires no ring packing. It can be made marine type, and of course can be either simple or compound.

"It is not a cheap machine, although it costs very much less than the ordinary engine. It weighs less and occupies only a fraction of the space of the old style engine. Mr. Brambel says: 'When anyone can build a fifty horse power engine that may be carried around in a hand satchel he has something that is very valuable, particularly when that engine is adapted to

letters of credit were verified by the inventor to-day when I called on him."

It is evident that the gentleman from Sleepy Eye is a very wideawake young person, and we take pleasure in publishing herewith an extract from his specification in which he describes the operation of the device. During the prosecution of the case some four patents were cited, one of which quite closely resembles the Brambel invention, and seems to depend upon the same general principle of operation. The extract reads as follows:

"Having described the construction of the improved motor, the operation thereof, briefly stated, is as follows: When the throttle valve is turned to admit steam or other motive agent to one of the inlet ports, said agent enters the cylinder adjacent to one of the expansion chambers, 25, and is thus admitted to one of the chambers or recesses in the piston. The expansion of the steam gives the impulse necessary to carry the piston in the direction indicated by the arrow (sic) in Fig. 2 a sufficient distance to bring the succeeding recess or chamber into the field of the incoming steam, the first named chamber being meanwhile exhausted at 12. The reversal of the motor is accomplished by moving the lever, 13, to cause the admission of steam through the other inlet port.

"It will be understood that in practice various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

"What I claim is—

"In a rotary engine, the combination of a cylinder having opposite heads provided with registering extended bearing boxes, inwardly divergent steam inlet ports communicating with the interior cylinder at their inner ends and a common valve casing at their outer ends, a cutoff and reversing valve arranged in said casing, a rotary piston arranged in the cylinder and provided with peripheral pockets adapted to communicate with steam chambers at the inner ends of said ports, registering cross-sectionally semicircular grooves formed in the contiguous faces of the piston and cylinder heads concentric with said bearing boxes, said grooves combining to form cross-sectionally circular lubricating ducts, a shaft mounted in said bearings and fixed to the piston, and lubricating devices in communication with the bores of said bearings, whereby lubricating material is adapted to pass between the ends of the piston and the cylinder heads and accumulate in said lubricating ducts to form packing to prevent the exhaust of steam or the passage thereof from one pocket to another of the piston, substantially as specified."

It had not been our intention to describe or notice in any way the above mentioned invention, but we are in receipt of so many inquiries from correspondents and so

many requests for copies of the patent that we have decided it was best to state the facts of the case and publish reproductions of the patent drawings and copy the salient features of the specification and the claim.

We have not written to Mr. Brambel for any light on the subject of his valuable patent. We learn, however, that he is a telegraph operator, and we imagine that possibly his vocation may have something to do with the



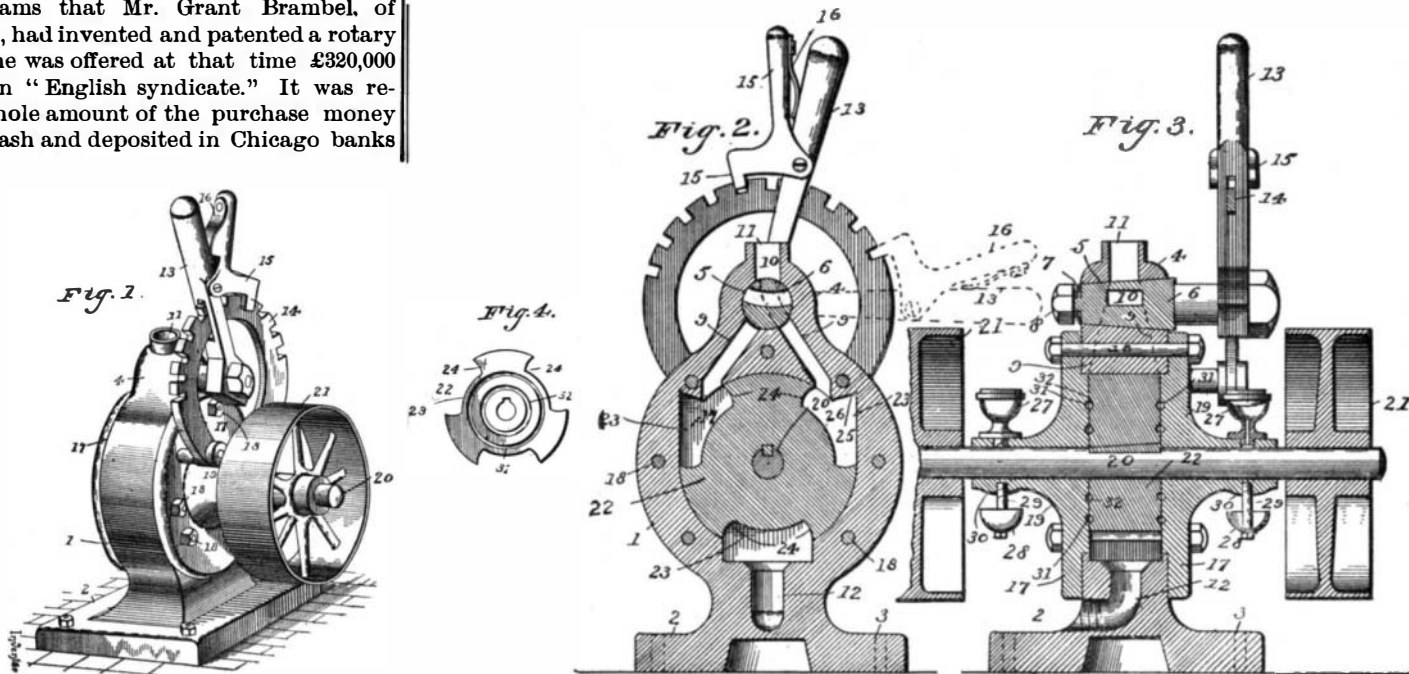
A FIFTY FOOT HUMPBACKED WHALE—VIEW SHOWING GREAT SIZE OF TAIL—TEN FEET FROM TIP TO TIP OF FLUKES.

any and all kinds of work wherever power is used. The Brambel engine of fifty horse power, weighing less than a hundred pounds, may be attached to the end of the armature of a dynamo and all the belting done away with, or a Brambel engine not larger than a common saucer could be attached to a creamery separator, and set it whirling at the rate of 6,500 revolutions a minute. The largest of these engines, 250 horse power in size, is less than a foot wide at the base and eighteen inches high. It is in use in a dynamo room at Trenton, N. J., and the firm say they never had a more satisfactory machine. The patent was obtained a year ago, since which time several machines have been built and put into use."

The latest telegram that we have seen proceeds from Sleepy Eye, Minn., dated January 16, 1897. We quote from the New York Herald:

"The sale of Grant Brambel's rotary engine to the Allen syndicate, of London, England, has been consummated, and the Sleepy Eye inventor has letters of credit on the Bank of England for \$6,700,000. The amounts paid were: For the English patent, \$1,600,000; for France and Germany, \$2,000,000; for the United States, \$3,100,000.

"These amounts and the fact of the receipt of the



THE "SEVEN MILLION DOLLAR" ROTARY ENGINE.