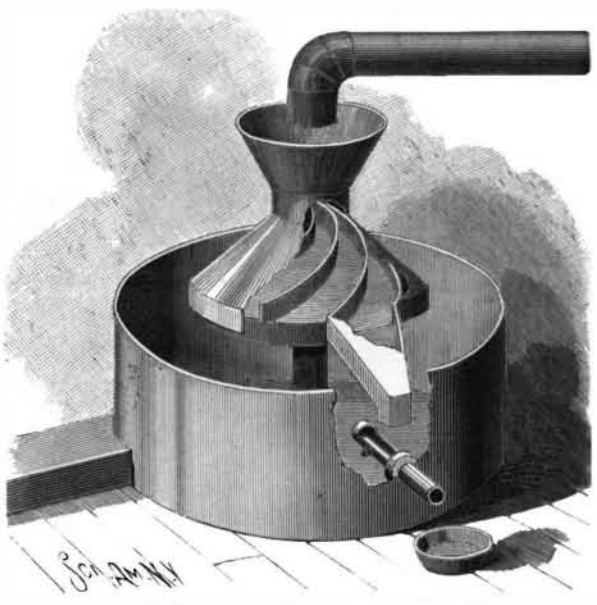
new smokeless powder. It is known as the Maxim-Schupphaus. It is a purely American powder, and in its present perfected form it represents the results of experiments which have been carried on steadily for the past four years. In 1893 the inventors were collaborating in the attempt to find a suitable propellant for firing large masses of high explosives from rifled guns, the object of their search being a powder which would give a less sudden initial acceleration to the projectile, with a more uniformly sustained subsequent acceleration in the gun than was possible with the then known powders. Realizing that the chief trouble with the existing smokeless powders was the serious erosion of the bore due to the high pressure and temperature of the gases, they determined to use gun-cotton, which gives low erosive effects, and to use such a form of grain that the surface at first exposed to the flame of ignition would be relatively small and then increase rapidly as the projectile traveled up the bore.

The theory worked out excellent results on the proving ground, as may be judged from the fact that a 35-pound projectile has been fired from a 4·7-inch gun with a velocity of 2,913 feet a second on a maximum pressure of only 35,000 pounds per square inch. Our new powder is not only free from erosive effects, but it has been proved to be thoroughly stable.

A NEW SAMPLING MACHINE.

The accompanying engraving represents an improved sampling machine which is arranged to utilize the pulp or other material as the motive power for setting the apparatus in motion.

The machine is provided with a fixed casing having an outlet for the discharge of the bulk of the material from which the sample has been taken. From the bottom of the casing a post rises upon which a cone-shaped wheel is mounted to rotate. This cone-shaped wheel has spiral ribs terminating in the apex of the



BYRNES' SAMPLING MACHINE.

cone, so that the material or liquid to be sampled and discharged upon the apex through a hopper, is equally divided by these ribs and flows down the sides of the cone in equal quantities between adjacent ribs. One of the chambers formed between two adjacent ribs terminates at its lower end in a sample chute formed with a downwardly-extending spout. A portion of the pulp or other material can thus be discharged into a sample receiver held in the wall of the casing, thence to be conducted to a receptacle outside of the casing. When the material passes down into the spiral chambers, it is evident that a rotary motion will be imparted to the cone-shaped wheel. The material is therefore discharged mostly into the casing, only a small portion being dropped into the sample receiver at each full revolution of the wheel. Any desired quantity can be taken as a sample of the entire bulk, the proportion being regulated by the make of the machine, the number of chambers, the diameter of the wheel, and the opening of the receiver. The apparatus has been patented by the inventor, Mr. Owen Byrnes, of Granite Butte, via Gould, Mont.

Important Experiments in Aerial Navigation.

The Engineer reports that, on July 27, a series of experiments in aerial research were conducted in the grounds of Shaw House, near Newbury. The experiments were carried out under the direction of the Rev. J. M. Bacon, Dr. R. Lachlan, Mr. J. N. Maskelyne, and others, with the advice and assistance of Lord Kelvin, Lord Rayleigh, and other men of science. The balloon was in charge of Mr. Percival Spencer and his brother, and was filled with 40,000 cubic feet of gas. The main object of the experiments was to discover in what measure the intensity of sound is influenced by altitude, by the presence of clouds, etc. The weather proved favorable for the observations, and the ascent was successfully made at twenty minutes past five o'clock, the balloon drifting steadily in a northwesterly direction. As soon as the balloon had had a fair start the series of experiments commenced. The first experiment in acoustics was with the voice, followed by five tests with musical instruments, these being succeeded by the discharge of rifles and blasts of the siren from an engine. Then came a rifle volley, followed by a roll of musketry, succeeded in turn by discharges of cotton-powder, four ounces being used in each charge. After this came three further discharges of cotton-powder, with eight ounces in each charge. When the balloon had traveled a considerable distance there were two explosions of cotton-powder with double charges, the final experiment being a comparison between a discharge of four ounces of gunpowder and four ounces of cotton-powder. The aeronauts had with them a receiving instrument, and by noting the altitude and the sounds which reached them, took the angular distance. The balloon descended at ten minutes to seven o'clock at North Denford. All the experiments proved highly successful.

A New Pompeii.

This title is perhaps an exaggeration, but it is certain that if the published reports are true, the German archæologists who are excavating on the site of ancient Priene have made a discovery of the highest interest. It is well known that Priene is in Asia Minor, and that the modern city, of Samsoun occupies its ancient site. Several years ago an English expedition unearthed and studied the temple of Minerva, the chief sanctuary of the city, built by order of Alexander; but its ruins, although interesting, were abandoned, and they have since been despoiled by the inhabitants of the neighborhood. In 1895 the Germans resumed the exploration of the region in behalf of the Berlin Museum, at the expense of the Prussian government and under the direction of a young architect, Wilhelm Wilberg. The work of excavation is already sufficiently advanced to enable us to judge of its rare importance; a whole city is being unearthed, in almost as good preservation as Pompeii. And this is the more important because up to the present no similar discovery has ever been made that gives precise indications of the general arrangement of a Greek city, of its public monuments, or its individual dwellings. The city thus exhumed is assuredly of the period of greatest Greek beauty; the streets cross at right angles and are laid out with the greatest regularity, and we can identify colonnades, theaters, market-places, shops, and houses with their decorations and interior arrangement. South of the temple of Minerva has been found the agora, surrounded with great colonnades, while opening on one of its corners is a small square edifice somewhat resembling a theater and constituting perhaps the place of meeting of the city council. It is in admirable preservation, and sixteen rows of seats can be seen still in place. Worthy of note is a vault in one of the walls—a thing extraordinarily rare in Greek architecture. We should add, in closing, that among the structures that have been entirely exhumed is a theater whose scene is intact, which will doubtless solve some of the problems connected with this special part of the Greek theaters.—Literary Digest.

A SCRUBBING MACHINE.

To provide a machine for scrubbing floors, so constructed that it will sprinkle water or a washing compound on the floor, take up the water, dry the floor, and deliver the material taken up into a receptacle forming part of the apparatus, Mrs. Hattie E. Lane, of Colfax, Ind., has invented the machine forming the subject of the accompanying illustration.

The apparatus is provided with a frame, in which wheels are journaled. In front of the wheels a drum is mounted, consisting of alternate sections of rubber and bristles, and operated as shown in the engraving. Above the drum a receptacle is located extending forward to some distance, and containing water or some washing compound. A valve, situated in the receptacle, controls the delivery of the water, and is operated from the handle of the machine. When it is desired to open the valve, a lever on the handle is operated, thus acting on the chain or cord connected with the valve. Springs automatically close the valve when the pressure on the lever is relieved. A receiver is suspended from the rear portion of the frame, and has its concave forward end in contact with the floor and with the drum.

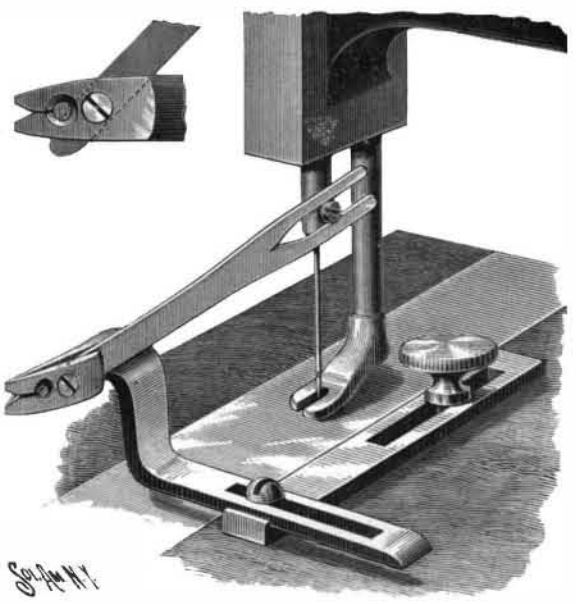
In operation, the valve being open, the machine is pushed along, whereupon water will be delivered to the floor in front of the cleaning drum. The floor will be scrubbed by the brushes on the drum, and will be dried by the rubber strips. The material taken up by the scrubbing drum will be delivered into the receiver suspended in the lower portion of the frame.

This device, it is claimed, will clean a floor as readily and as perfectly as a brush operated by hand.

AN IMPROVED SEAM-RIPPER.

In an invention recently patented by Lemuel Merrill, of 52 Federal Street, Boston, Mass., a novel device is provided for ripping seams which is so constructed as to cause a reciprocating knife held between the members of a body-section to cut the threads of a seam at both up and down movements.

In the attachment illustrated, a shield-like device is provided which is formed to receive the seam and which co-acts with the reciprocating ripper-arm. The shield



SEAM-RIPPER ATTACHED TO A SEWING MACHINE.

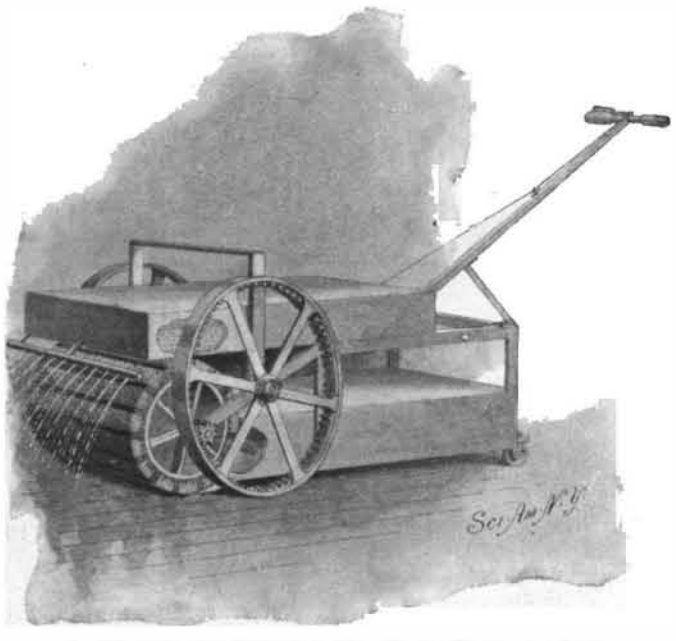
forms part of an attachment adapted to be adjustably secured to the sewing machine, and is provided at its front end with a tapered slot terminating in a circular opening. This circular aperture enables the cut threads to leave the shield readily. The ripper-arm is pivoted to the shield and at its forward end is sharpened to a rounded cutting edge. By its reciprocating movement across the slot of the shield, the arm is enabled to cut both at its up and down movements. As shown in the illustration, the arm may be operated by the needle-bar of the machine, the forked rear end of the arm engaging the bar for that purpose.

In practice the invention is also embodied in a hand ripping device, formed after the manner of scissors.

When used in connection with a machine, both hands are free to guide the work. While the threads of a seam may be readily cut by the knife-edge, there is, nevertheless, no danger of cutting the material, since the knife-edge is protected by the shield.

Human Hair.

It is a curious fact that red-haired people are far less apt to become bald than those whose hirsute covering is of another hue. The average crop on the head of the red-haired person is said to be only about 30,000 hairs. Ordinary dark hair is far finer, and over three dark hairs take up the space of one red one; 105,000 are about the average. But fair-haired people are still better off; 140,000 to 160,000 are quite a common number of hairs on the scalp of a fair-haired man or woman. A curious calculation has been made, to the effect that the hairs on the head of a fair-haired person, if they could be plaited together, would sustain a weight of something like eighty tons, equaling that of five hundred people.—Medical Record.



A NOVEL MACHINE FOR SCRUBBING FLOORS.

ITALY is the first of the powers to learn a lesson from the war. The Navy Department has given orders that wood shall not be used on battleships.

Typewriter's Cramp.

Sufferers from writer's cramp are, in the majority of cases, quite able to produce manuscript by means of a typewriting machine, but an instance in which this resource failed is recorded by Dr. F. Hampson Simpson in a recent number of The Birmingham Medical Review. He states that he is not acquainted with any authentic record of a similar case, although he has recently met with two examples of what was called typewriter's cramp; one of these patients, however, seemed to suffer from neuritis and the other from pain and fatigue in the right hand unaccompanied by muscular weakness or spasm. The patient whose symptoms Dr. Simpson describes is at present a muscular man, thirty-three years of age. He became a clerk when eighteen years old, and then wrote with a pen on an average from seven to eight hours daily. In March, 1889—that is, after about seven years of this employment—the initial symptoms of writer's cramp declared themselves, and at the end of three months all the fingers of the right hand were invaded by spasm, which seriously interfered with writing. In 1889 he learned to use the typewriter machine, and in 1890 he commenced learning to play the harp, but after a few months he found that playing brought on cramp, affecting the right hand generally, more especially the first and second fingers, so that he gave up the harp at the end of 1890. For three years (1893-94-95) he was at sea as interpreter on board a transatlantic steamer. In January, 1897, he entered an office as typewriter, but was only engaged in working the machine from two to three hours daily. Toward the close of one of the days at the end of February, while at work "typing," his right index finger became bent by cramp. From this time on, a repetition of the cramp occurred toward the evening of each day, a slight involuntary flexion at the wrist being superadded, and in less than a month the exaggeration of the spasm led him to substitute the middle for the index finger; six or seven days later this middle finger also became the seat of similar spasm. Dr. Simpson observed very little tendency to spasm in the operating finger of the right hand during the early portion of the day's work, but after about two or three hours typing the index finger of the right hand (and the middle finger since its substitution) became very fatigued, and to the flexion of the finger and wrist incidental to striking the keys there was superadded a spasmodic contraction which overflexed those parts. This did not appear, however, to seriously impair the precision of his touch, and an inspection of his type-written work revealed no objective evidence of the spasm in the right finger. It was suggested that he should strike the keys with a little hammer or percussor, and he employed this with much benefit and relief for some little time, but the cramp now affects the whole forearm, and he intends to abandon his present occupation for another of a totally different description. He has been a pianist for many years, and his piano-playing is not in the least interfered with by any digital spasm; his technique and execution are above the average, and his prestissimo passages are perfect.

The Chemistry of Gout.

The results of an investigation recently carried out by Dr. A. P. Luff, as to the value of certain drugs in the treatment of gout, throw considerable doubt upon the views held concerning the efficacy of alkalies as remedial agents in that disease, so far as regards the removal of uric acid from the system by their solvent action. From Dr. Luff's experiments it appears that neither potassium nor sodium bicarbonates, lithium carbonate, potassium or lithium citrates, or sodium phosphate, exercise the slightest influence in delaying the conversion of quadriurate into biurate. A similar conclusion was drawn from experiments with salicylates, piperazine, and lysidine. None of these substances was found to increase the solvent power of the blood for sodium biurate, and hence it is inferred that their administration to gouty subjects with the object of removing uratic deposits in the joints and tissues appears to be useless.—Pharmaceutical Journal.

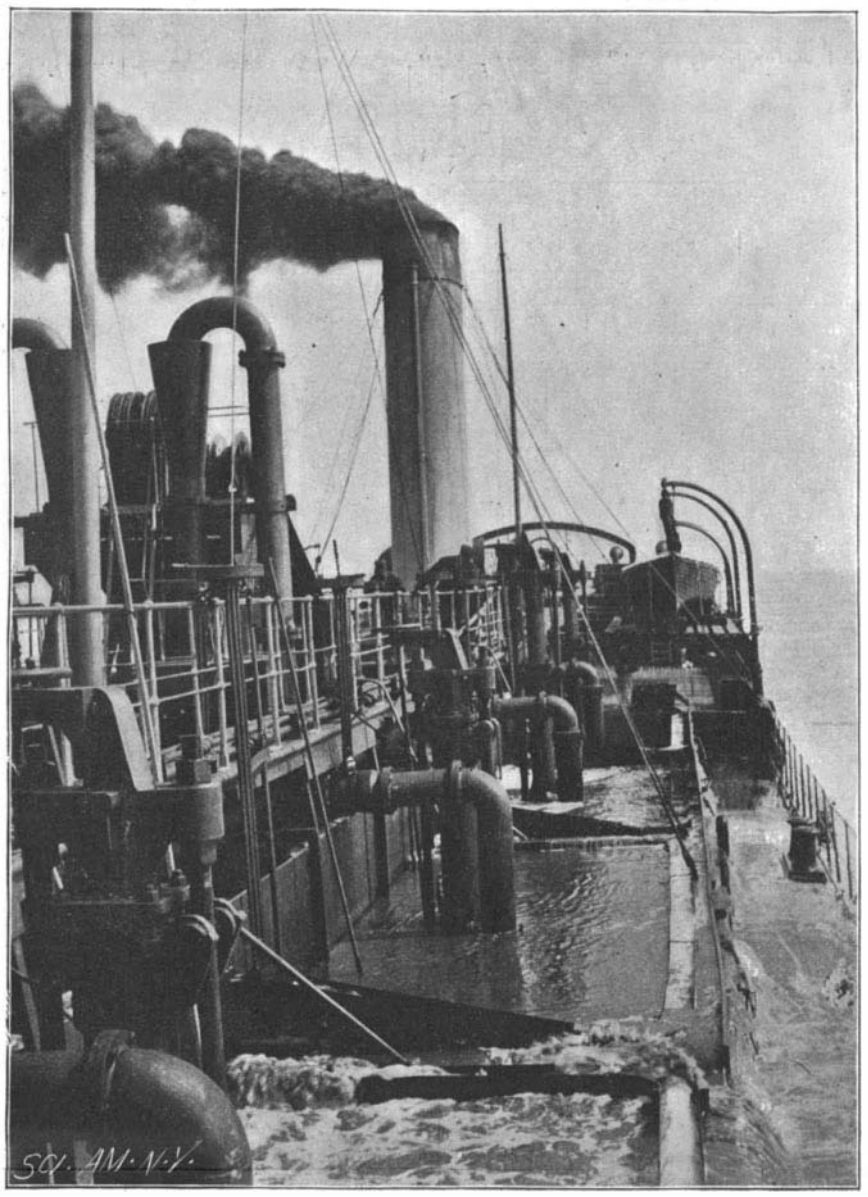


Fig. 1.—DECK VIEW OF THE "BRANCKER," SHOWING THE TANKS AND THE HYDRAULIC HOISTS FOR TANK CYLINDERS.

THE GREAT SEA-GOING DREDGES ON THE MERSEY BAR, LIVERPOOL.

An examination into the local tidal conditions at Liverpool shows that the estuary of the river Mersey and the channel in front of Liverpool are very much like a bottle, with the large part above Liverpool and the neck right at the city, and then an expanding, flaring mouth out to sea. The tides, which are at "springs" 31 feet high, rush twice each twenty-four hours through the neck and up into the great bottle and out of it again. The current acts with tremendous force as it rushes in and out, scouring a channel in front of Liverpool 60 feet deep through the narrow, contracted neck of the bottle. But up in the bottle it spreads out and moves about here and there great masses of sand, shifting its channel of flow from time to time, and generally conducting itself in the most independent and erratic manner. When it rushes out at ebb, or falling, tide, trying to empty the bottle as quickly as possible, it scours its way to sea through the sands which the ocean waves have drifted in. Such was the force of the outgoing current that it was able to maintain a channel through the sea bar eleven miles from the shore line with 10 feet of water in it at low tide at the shoalest point, or 42 feet at high tide.

Here occurs a very interesting episode in which one of our own engineers played an important part. In 1883, the Manchester Ship Canal project had assumed definite shape and had been presented to Parliament, which alone has the power in Great Britain to authorize the building of railroads, canals, or other commercial works. Manchester is about thirty-five miles from the deep water in the estuary, and lies on one of the small rivers, the Irwell, that empties into the Mersey. The plan proposed to Parliament was to come down with the canal from Manchester to Runcorn, on the estuary, and from that point to build training walls and to dredge a channel out into the estuary for several miles until deep water was reached. Liverpool, which looked with disfavor upon the canal project, since it would, if carried out, cause loaded vessels to pass by it going up the canal to Manchester instead of unloading goods at Liverpool, opposed the project before the Parliamentary committees.

The Mersey Dock and Harbor Board of Liverpool employed Capt. James B. Eads, the distinguished American engineer, to investigate the effect of building the canal into the estuary of the Mersey. Capt. Eads studied, compared, and worked out the hydraulic conditions, and presented to the Committee of Lords, which had the subject in hand, a clear, graphical exhibition of the great and potent causes that maintained a channel of 10 feet at low water on the Liverpool bar. He proved that this depth was entirely due to, and was essentially dependent upon, the reservoir capacity of the estuary; that to reduce this would reduce the depth on the bar; that in every average tide, twice each twenty-four hours, 500,000,000 cubic yards of water passed into and out of the estuary; that every yard of this water was needed to maintain the depth eleven miles out in the ocean; and that, consequently, the building of the walls of the canal several miles into the Mersey would occupy the tidal area and injuriously affect the depth of water on the sea bar. He convinced the committee, but they asked him how he would himself build the canal if he had it to

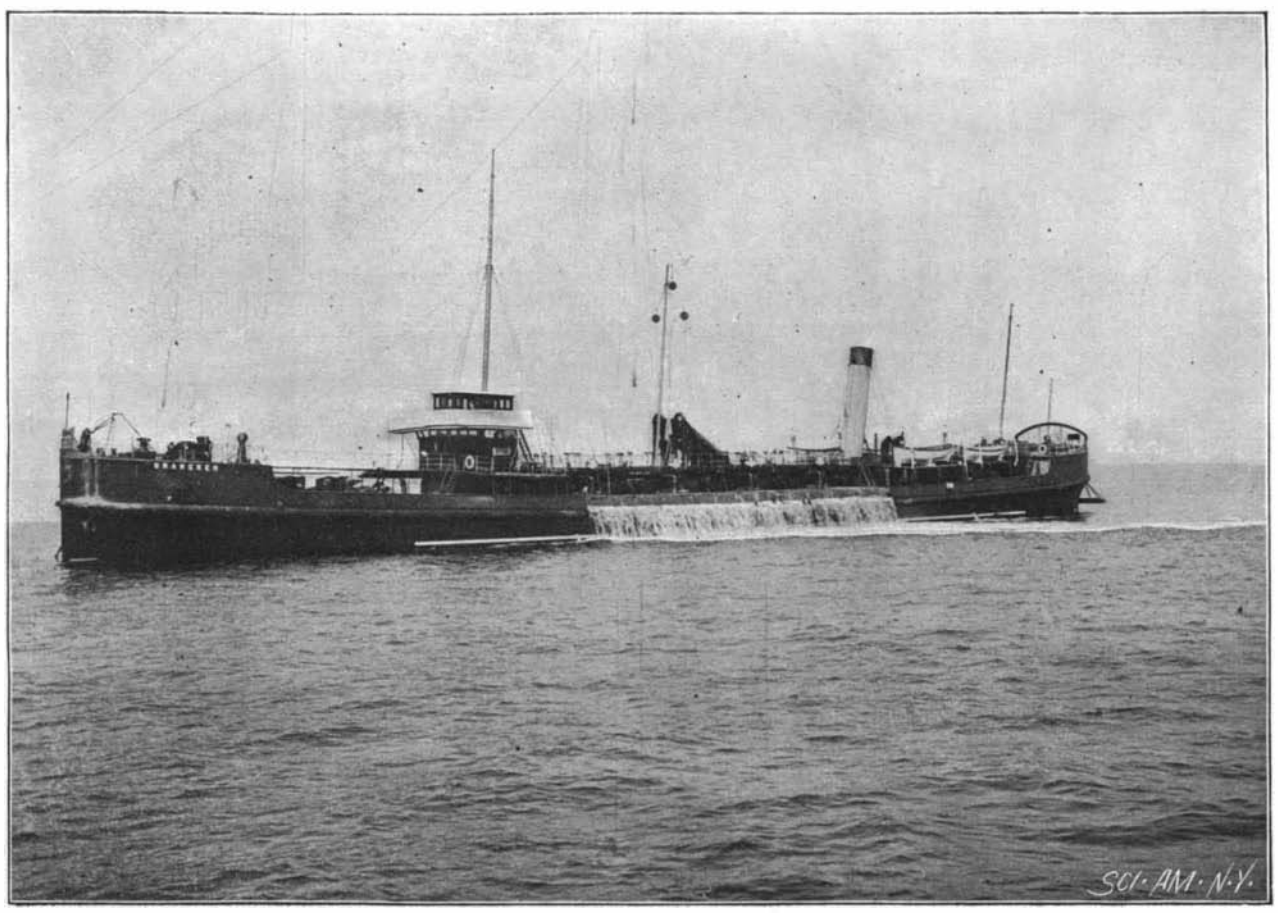


Fig. 2.—THE SEA-GOING DREDGE "BRANCKER" AT WORK ON THE MERSEY BAR, LIVERPOOL.
Length, 320 feet; beam, 47 feet; depth, 20½ feet. Capacity, 2,700 tons per hour.