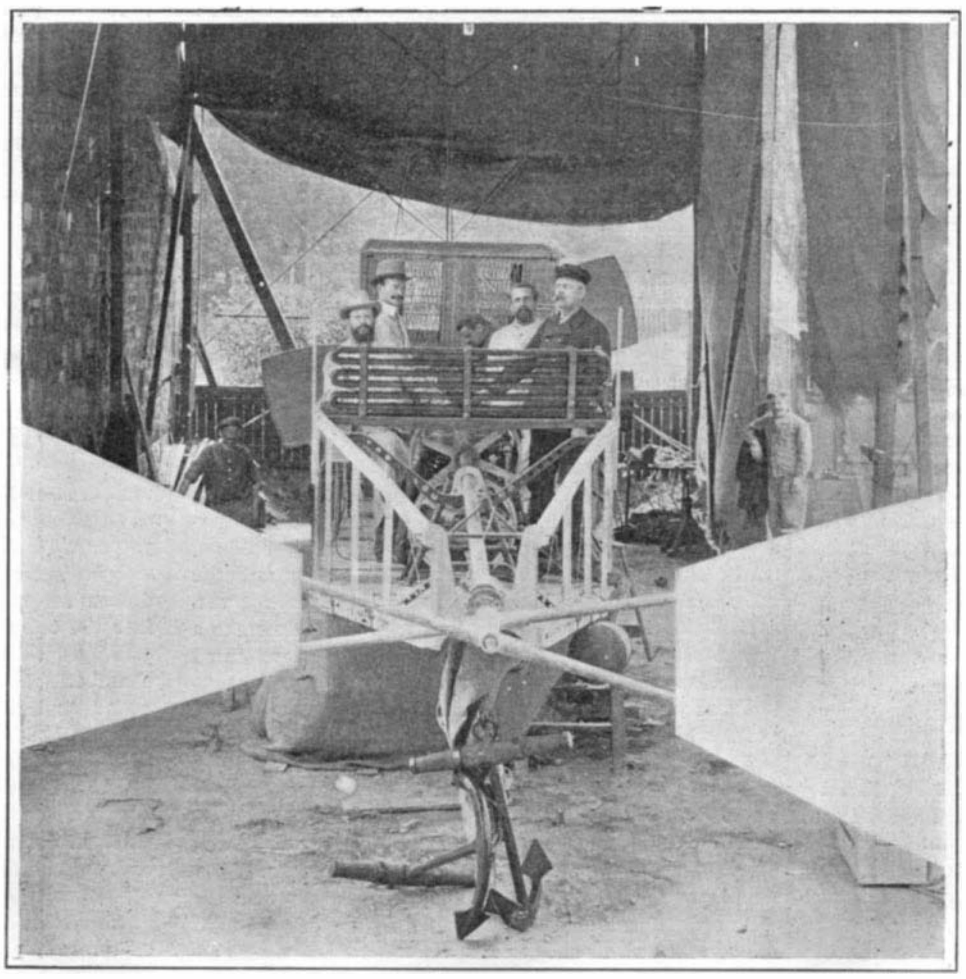
WELLMAN'S AIRSHIP FOR HIS NORTH POLAR EXPEDITION.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The airship in which Walter Wellman, accompanied by three other men, expects to make a dash for the North Pole from Tromsoe, Norway, next month, has been designed and constructed with very great care by Louis Godard at his aeronautic establishment near Paris. The balloon itself is a remarkable piece of work, aside from the fact that it ranks among the largest airship balloons that have ever been built. The most casual observer will notice its substantial construction, and it seems likely to weather the severest shocks which it may receive in the voyage toward the Pole. No less than seven thicknesses have been used by M. Godard in making the canvas. The principal novelty lies in the use of layers of pure Para rubber, which are placed between the layers of silk and cotton canvas. This is the first time that a light, as well as a strong, envelope has been secured in this way. Starting from the inside, we have first a layer of strong and specially woven French silk fabric; then on the silk is applied a layer of rubber, and on top of this comes a layer of cotton canvas. A thinner layer of rubber comes next, and then a second layer of cotton. Over this and forming the outer coating of the balloon is a thin layer of rubber. Such a combination of layers is very resistant, both to the pressure of the gas and to the moisture, which is one of the well-known features to be met with in the Polar regions. Seeing that the rubber is attacked by the atmosphere, it is not a usual thing to place it on the outside of the balloon; but in the present case it has been used for a number of reasons, the principal ones being that the airship will be in use but a comparatively short time, and that it was desired to have a smooth surface and especially to avoid the penetration of moisture into the tissues of the balloon, which would weight it down.

What is striking about the whole construction is the practical ideas which prevail in the design of all the parts. Thus instead of using a long cigar-shaped body, M. Godard preferred to shorten up the balloon considerably, and give a length which is only three times the largest diameter, so as to make it quite steady and easy to handle in the filling operations as well as in the actual flight. Thus we have a balloon whose total length is 160 feet and greatest diameter 52 feet. The large diameter lies near the front and in the proportion of 2 to 5. The cubic volume is 8,200 cubic yards, and the total surface of the balloon 2,400 square yards. A long guide-rope will trail upon the ice so as to steady the airship's flight. For these different reasons it will be seen that the chances of accident are very much lessened.



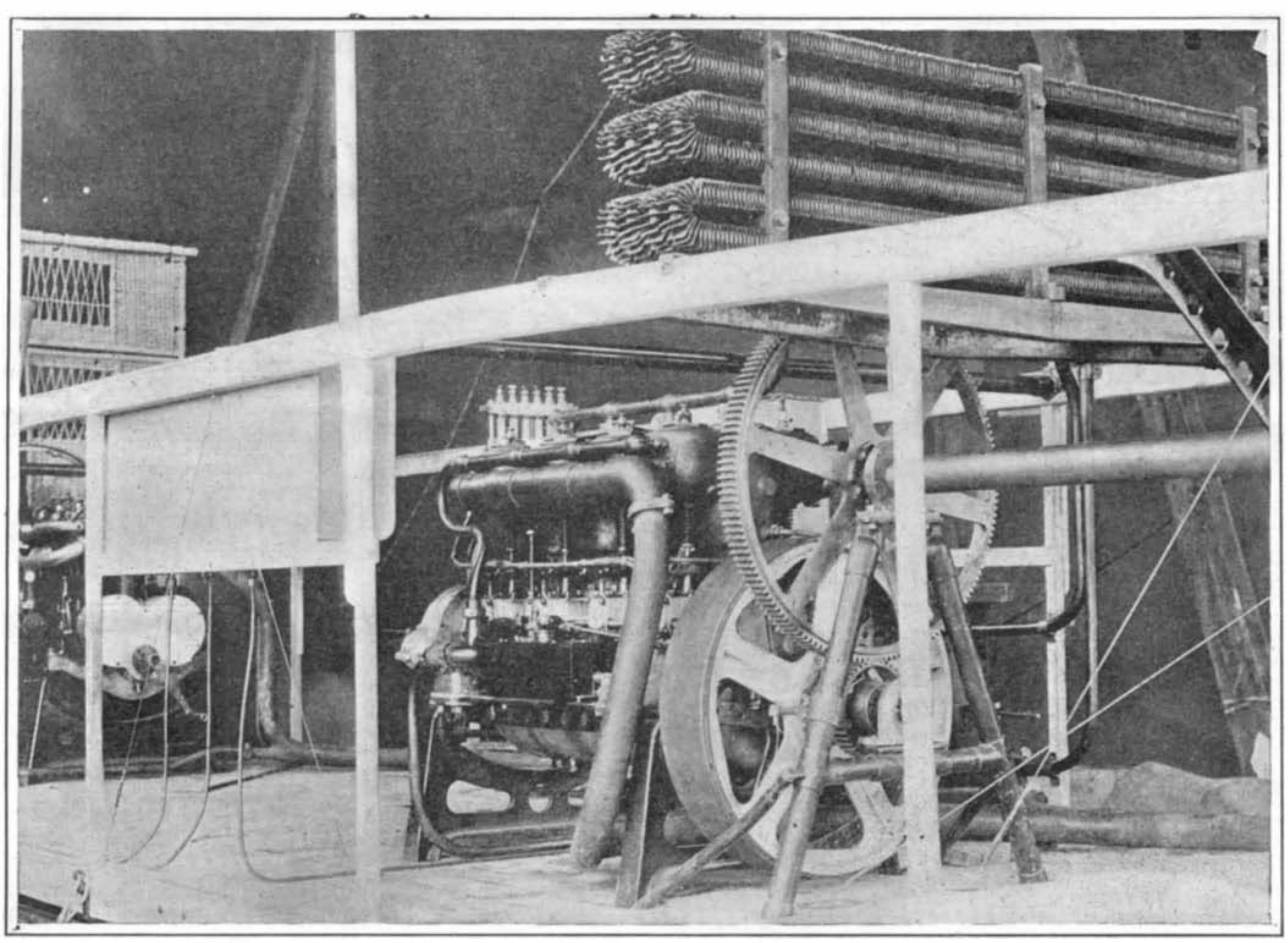
Front End of the Airship Body. The Man in Black is Walter Wellman.

The car (body part) of the new airship, while it is built along the general lines which have now become familiar, has many new points when we come to examine it in detail. Credit must be given to the well-known engineer, H. André, for much of its design. Suspended below the balloon body by steel piano wires, the nacelle, which measures about 50 feet long by 6 feet wide and 4 feet high in the middle part, is tapered out at both ends, with the longer taper in front and the shorter toward the back. A slight change has been made over the first design of the nacelle, and it now tapers down both on the top and bottom of the frame, ending in a portion about 18 inches square which is formed of an aluminium frame containing the propeller-shaft bearing. At each end of the nacelle is a propeller driven by a separate motor. At the rear of the middle platform is situated the main cabin for the aeronauts, which is formed of basket work. In front of it is the 25-horse-power motor for the rear propeller, while still further forward is the main motor for the front propeller. The space lying around and between the two motors forms the main platform or deck of the airship, and here will be stationed the aeronaut Hervieu, whose long experience led him to be chosen as second in command, along with the machinist Colardeau. Inside the cabin Mr. Wellman and Major Hersey will have their quarters.

The main beams of the nacelle, which run from end to end, are formed of timbers of rectangular section reinforced by an angle piece in aluminium, which is placed on the outside and nearly covers the beam. The upper and lower beams are joined by a series of light wood braces placed vertically and spaced about 5 feet apart. At the middle part the height of the frame is about 4 feet. A set of wood braces run across between the two lower beams and serve to support the flooring, which is a continuous platform running from one end of the nacelle to the other, so that it is easy to circulate upon it. The main cabin, made of osier, is somewhat above a man's height and covers the whole width of the nacelle, having almost a cubical form. On either side are six windows of a light basket work, and other windows are made in the front and rear of the cabin. A complete set of wireless telegraphy apparatus is to be installed in the cabin. The mast wire is formed by the steel guide-rope cable which trails upon the ice. Thus the party will be able to keep up a constant communication with the base of operations at Spitzbergen and from there with Hammerfest, so that if all goes well we will constantly have news of the expedition.

The question of providing the motive power which is to propel the great airship has been solved in the most practical manner by the use of two gasoline motors and two separate propellers, so that if anything should happen to the principal motor, the second one will be sufficient to run the airship by means of the smaller propeller. Toward the front part of the main platform is mounted the 60-horse-power motor of the automobile type, constructed by the well-known Clement firm, of Paris. This motor will be observed in the foreground of our illustration, together with the gearing which connects it with the main shaft of the larger propeller. Above the motor is placed a set of radiating coils consisting of 24 flanged tubes. The radiator has piping which runs to both of the motors. As regards the Clement motor, it is of the most recent design and has four vertical cast-steel cylinders mounted on an aluminium crank-case. Both the inlet and exhaust valves are cam-operated. On the front side is a water pump and on the rear a magneto, both geared to the main shaft.

The second gasoline motor, which is placed near the cabin, is of smaller size, being but 25 horse-power. It was furnished by the Turgan Company, of Paris, and has two separate cylinders. The magneto and water pump are both located at the rear. Single-reduction gearing is used to connect each of the motors to their respective propeller shafts, each motor being used exclusively for its own propeller. The pinion is mounted outside the flywheel of the motor and upon a triangular frame made of steel tubes is supported an outer ball-bearing for the motor shaft. At the top of the frame is a second ball-bearing for supporting the main shaft of the large propeller, which is about three inches in



Center of Body, Showing Cabin on the Left, the Two Motors and Radiator, and the Gears Which Drive the Forward Propeller Shaft.

THE BODY PART OF WELLMAN'S AIRSHIP FOR HIS NORTH POLAR EXPEDITION diameter. On one end of the latter shaft is placed the large gear wheel which meshes with the pinion. The front propeller works at the rate of 260 R. P. M., while the smaller one runs at 280 revolutions. By running both propellers at the same time we obtain a total of 85 horse-power for the airship. As it is not desired to travel faster than about 15 miles an hour the large propeller alone will generally suffice. With both motors the speed will be 20 miles an hour. Steel-tube framing covered with stout canvas is used for both propellers. The diameters are 18 and 15 feet respectively.

Next to the rear motor is mounted a small five-horse-power motor of the Werner two-cylinder motocycle type. It is used for driving the air blower which fills out the inside air-bag, or balonette, contained in the balloon.

At the rear end of the balloon is a vertical rudder, and a horizontal frame runs under the balloon for some distance in order to steady it. On the nacelle is placed a 20-gallon gasoline tank of flat form and a 10-gallon water tank. The main gasoline supply is carried in a set of long cylinders. Under the nacelle will be hung a large, flat basket or car which will hold all the supplies and provisions. One of the features is an automobile sled which contains provisions for 75 days, and is designed to run on the ice by means of a cylindrical roller provided with points.

By the time this article appears, the material will have already been packed up and sent to Spitzbergen, and Mr. Wellman, along with his aids, will have arrived on the spot, where Major Hersey has been erecting a great balloon shed along with annex buildings, a meteorological station, and a hydrogen plant.

THE TAMENESS OF WILD ANIMALS.

(*Continued from page 6.*)

has been established half way up the island. It has been the custom for years for fishermen in cleaning their fish to toss the refuse into the bay, and the sea-lions formed the habit of coming down to the bay at this time to dine thereupon. At first only one or two came; now a band of two large bulls and several females make their headquarters at the bay, or spend most of the time there, constituting a valuable sanitary corps, as they eat every fragment of fish, the gulls joining in the feast. When not feeding, the sea-lions pass the time lying within a few feet of the beach, sleeping or playing, the females and young leaping from the water and going through various tricks of interest to the looker-on.

But a few feet away from the sea-lions are the boat-stands of the fishermen and boatmen, and boats are moving out and over the sea-lions constantly; yet they are apparently oblivious to the men, who never molest them. This has had a peculiar result. The enormous animals have become so tame that they almost allow the men to touch them, and readily come out upon the shore to feed from their hands. It so happened that I was upon the sands when no sea-lions were in sight, and upon asking a boatman where they were, he began to whistle, as though calling for a dog, and to call, "Here, Ben!" repeating the call several times, whereupon out from among the anchored boats appeared not only Ben, but two large bull sea-lions, which must have weighed half a ton, followed by two or three smaller females. The boatman tossed some pieces of albacore into the water, which the sea-lions dashed for, and down upon their heads plunged several score of gulls, paying not the slightest attention to the huge animals cavorting about. The sea-lions seized the dead fish under water, brought it to the surface and with a violent swing back and forth, tore the fish in pieces, the birds taking the debris, while several large pelicans floated in the immediate vicinity ready to pounce upon any fragment that came their way. Not ten feet from this interesting scene floated several boats containing spectators, yet the wild animals paid no attention to them, affording a remarkable illustration of the tameness of animals when protected. When this fish was disposed of the boatman took a large albacore by the tail and walked down the beach, calling the sea-lion by name. The animal responded at once, coming inshore with a rush, followed by two others. The boatman gradually retreated up the beach, the huge animals following, in their clumsy waddle, resembling gigantic slugs more than anything else, finally taking the fish from the man's hands. The scene was so remarkable, the confidence in the man so complete, that I requested a local photographer, Charles Ironmonger, to photograph the group, and the accompanying illustration is the result, showing a dramatic situation that occurs daily at Avalon Bay on the main street of the little town, affording a free show to visitors and sojourners on the island. The rookery where the animals make their headquarters is about two miles distant, and the sea-lions are so tame here that they can be approached with ease, and are the constant objects of amateur photographers who visit the locality in yachts and boats of various kinds.

THE PETERBOROUGH LIFT-LOCK OF THE TRENT VALLEY CANAL.

For many years great interest, particularly in Canada, has attended the construction of the Trent Valley canal project, to join Georgian Bay with Lake Ontario by means of a waterway, partly artificial, partly using natural watercourses, across the Province of Ontario. By means of this canal the long detour through Lakes Huron, St. Claire, and Erie is avoided, and the distance from the upper lakes to the eastern end of Lake Ontario is shortened by about 250 miles. In the total distance of 203 miles there are only about 20 miles of actual canal, the remaining portion of the waterway being through lakes and river stretches rendered navigable by dredging or by building dams. It is intended that the waterway shall have an ultimate depth of 8 feet, though at present the depth is but 6 feet. The configuration of the territory through which the waterway runs necessitates thirteen locks of the ordinary type, 134 feet by 33 feet, and three hydraulic lifts. Two of the latter are as yet but partially completed, though the third, near the town of Peterborough, has recently been opened to traffic. The construction of the Peterborough lift is of interest for various reasons; primarily, because it is the largest structure of this character in existence, and because concrete has been almost exclusively used in building it.

All the more recent structures on the Trent Valley are of concrete, and this material has been used wherever possible, in high-level bridges, swinging bridges, dams, culverts, and locks. The waterway is a barge canal, and when the 8-foot depth has been reached vessels of 800 tons burden may be used. The time for a tow to reach Montreal from Georgian Bay is estimated at six and a half days, employing steam barges as tow-boats as well as freight carriers. The entire cost of the canal when completed will be under $10,000,000.

The hydraulic lift-lock at Peterborough is on a four-mile section of the canal, and overcomes an elevation of 65 feet in a distance of 800 feet. The hydraulic lift-lock is theoretically automatic in principle, and is of great value where considerable differences of elevation are found in comparatively short distances, or where water available for canal use is scarce. The lift is operated on the principle that as a loaded vessel descends in one chamber of the lock, an empty one ascends in the other chamber, an additional volume of water in the lifted chamber being raised to the upper reach as the difference between the weights. A novel feature of value in the lift-lock is that it is double, permitting two vessels to be locked up and down respectively at the same time.

The Peterborough lock, as in other similar structures, consists essentially of a pair of watertight steel boxes, or chambers, carried by heavy trusses which are supported by two rams, each of which works in a steel press under each chamber. In the present instance the rams are 7 feet 6 inches in diameter, and the presses are connected by a 12-inch pipe, provided with a regulating valve governing the flow of water from one press to the other. The chambers are provided with swinging doors at each end, hinged at the lower edge and swinging outwardly, to permit the ingress or egress of the vessels raised or lowered. The gate construction of the Peterborough lock is a departure from the usual form of sliding gate heretofore employed, and is said to be a distinct improvement over the older form. By means of the lift-lock the operation is materially shortened, as it takes but three minutes to raise or lower the lock chambers, and from twelve to fifteen minutes to pass one or two vessels through the lock. As a further precaution, a hydraulically-operated gate is placed on the upstream of the lock.

The lock is built upon a mixture of hard clay, stone, and bowlders overlying a limestone rock, which forms the foundation for the substructure, built wholly of concrete. This substructure includes the main or breast wall, the wings, the side walls, and three towers, as well as the walls which terminate the lower reach. The main wall serves as a retaining wall for the upper reach, while the wings serve to hold the side embankments. The structure has been carried out in pleasing architectural effect by means of moldings and pilasters formed in the concrete.

The towers are approximately 100 feet high from the rock, and some 30 x 40 feet at the base. These towers contain the guides for the chambers, and the central one has, on its top, the cabin from which the lock operator controls the mechanism. The main wall is 126 feet long at the base, 80 feet in height, and 40 feet thick. It is pierced by a roadway, and thereby obviates the necessity of a swinging bridge. In the main wall, too, is a chamber in which the turbines and pumps are installed. The chamber pits are kept dry by the side walls which, as mentioned above, form the retaining walls for the earth alongside the waterways. The pits under the chambers are separated by a 12-foot wall.

The lock chambers are of large size, having clear inside dimensions of 139 x 33 feet, with a height of 9 feet 10 inches. The trusses which carry the chambers are of the double cantilever style, while four plate girders 9 feet in depth bring the load directly on the top of the ram columns. Each chamber weighs 800 tons empty, and 1,700 tons when filled with water. The pressure on the rams is nearly 600 pounds to the square inch. The rams are hollow and of cast iron, about 3¾ inches thick. The presses in which the rams work are steel castings having an internal diameter of 92½ inches and 3½ inches thick, the space between the rams and the presses being 1¼ inches. Each press was tested to a pressure of 2,000 pounds to the square inch; and the stuffing box at the top, filled to a depth of 9 inches with braided hemp held in place by a steel gland, does not leak under a pressure of 1,200 pounds to the square inch. The press wells are 18 feet deep, 16 feet 6 inches in diameter, lined with concrete to a finished depth of 14 feet 2 inches. To take the heavy load at the bottom of the presses, estimated at 2,000 tons, large blocks of granite were employed as foundations.

The lock is operated by placing the lower chamber with its bottom level with the bottom of the canal, thus allowing it to contain an 8-foot depth of water, while the bottom of the upper chamber is 10 inches lower than the bottom of the canal above, and thus contains water to a depth of 8 feet 10 inches. This gives the upper chamber an approximate weight 100 tons greater than the lower one. When the vessel has entered the lower one, the gates are closed and the valve of the connecting pipe is opened. The extra weight in the upper chamber causes that chamber to descend, forcing the water from the press below it into the other press, and causing the other chamber to rise with the rams that bear it. The weights of each chamber will be the same, whether merely filled with water or bearing a vessel, for, as is well known, a floating body displaces exactly its own weight of the liquid.

It is, of course, necessary to form a watertight joint between the end of the chamber and the end of the reach of the canal, the distance between the two being a little less than 2 inches. The joint is accomplished by means of a rubber hose fastened to the face of the reach along the sides and bottom, which is inflated with compressed air. The tube is flat and lies along the frame of the gate, and requires little air pressure to make a tight joint. Large rubber strips are employed within the chambers to prevent water leakage along the rims, the edges of the gates being machined to true surfaces which press against the rubber strips.

Various devices, including pumps and an accumulator having a ram, are used to remove casual water in the lock chambers and to supply water losses arising from the operation of the lock. Certain of the pumps are operated by turbines working under a 65-foot head in a chamber in the substructure.

The Death of George J. Snelus.

George J. Snelus, the metallurgist, vice-president of the Iron and Steel Institute, died on June 20 at the age of 69 at his residence, Ennerdale Hall, Fritzington, Cumberland.

The family of George James Snelus was impoverished when he was but seven years old, but the mother succeeded in giving the boy a good education and he was trained for a teacher at St. John's College, Battersea. After teaching several years he studied sciences at Queen's College, Manchester, and the Royal School of Mines, for which he gained a free scholarship. At the latter he had a brilliant career, carrying off medals and scholarships, and upon graduation securing appointment as chief chemist at the Dowlais Works, a post he filled for four years and a half. In 1871 he was made a member of the scientific commission sent to the United States to investigate steel-making processes, and on his return to England he announced the discovery of a process which enabled the making of pure steel from impure iron in a Bessemer converter lined with basic materials. This discovery of the basic steel process gained him the gold medal of the Iron and Steel Institute in 1883 and revolutionized the steel-making industry, as phosphoric iron, theretofore useless in steel making, could be used. His processes are employed in all countries.

A large roundhouse, with locomotive drop-pits of novel design, and equipped with an overhead traveling crane, has been built in connection with two new yards of the Pennsylvania Railroad at East Altoona, Pa. The roundhouse is a complete circle 395 feet in diameter, with fifty-two stalls 90 feet deep, and is served by a turntable 100 feet in diameter. The main portion is 65 feet wide, with a 60-foot 12½-ton crane, while parallel with this is a lean-to span in which the smoke outlets are placed. There are four drop-pits, one large enough to take all driving wheels at once, two for single pairs of driving wheels, and one for truck wheels. The table of each pit is operated by vertical screws working in nuts revolved by worm-wheel gearing, the screws descending into iron pipe sunk below the floor of the pit.