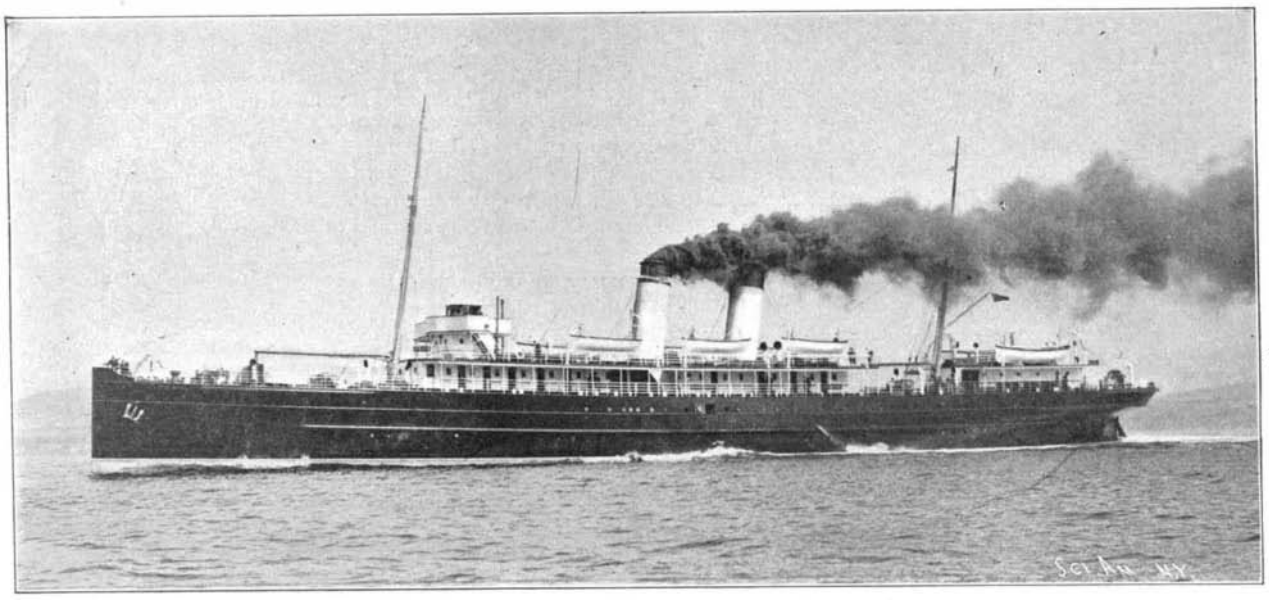
THE NEW CALAIS-DOVER TURBINE STEAMER.

The inauguration of a cross-channel, turbine steamer service which took place Saturday, June 27, marks another important step in the application of the steam turbine to marine propulsion. The new vessel is the first turbine passenger steamer to be used in deep-sea service, for her predecessors, the "Queen Alexandra" and "King Edward," were merely river boats intended for service in quiet waters. The new boat, however, which is known as the "Queen," will be engaged in daily service across one of the stormiest and roughest stretches of water in the world, and if she fulfills her promise, the turbine marine engine will have moved another step forward toward the day when, as we confidently believe, it will become the standard marine engine for all classes of service.



THE NEW TURBINE PASSENGER STEAMER "QUEEN" FOR THE CALAIS-DOVER ROUTE.

Length, 310 feet; beam, 40 feet; speed, 22 knots per hour.

Cross-channel steamers plying across the North Sea, the English Channel, and the Irish Channel have certain well-defined features which are easily recognized, and distinguish them sharply from the steamers engaged in similar service in American waters, such vessels, for instance, as the well-known Sound and Hudson River steamers. As a class the English boats are marked by low freeboard, narrow beam, and a comparative absence of deck-house accommodation. The "Queen," however, has a lofty freeboard, the cumbersome paddle-boxes have disappeared, and she has, for an English boat, fairly generous accommodations above the main deck. In point of lines and general contour she certainly looks to be a handsome and able sea-going craft. She is 310 feet in length and 40 feet in beam, or 5 feet more than the breadth of any previous steamer on this line. For about two-thirds of her length she is fitted with bilge keels, which will serve to keep her steady when she is running in the trough of the seas which prevail in the English Channel between Calais and Dover. The motive power consists of three turbine engines, driving three shafts. Originally the vessel had five propellers; but two have been removed, leaving one propeller on each shaft. The live steam enters first the high-pressure turbine on the center shaft, where it is expanded five-fold. It then passes to the low-pressure turbines on the side shafts, where it is expanded twenty-five fold, and from the low-pressure turbines it passes to the condensers. When under way clear of the harbors, all three turbines will be in action in the go-ahead direction; but in making a landing the outer shafts only are in operation, the vessel thereby securing all the advantages of maneuvering due to twin-screw propulsion. For reversing there is placed inside the exhaust end of each low-pressure turbine a reversing turbine, suitable valves changing the flow of steam from the go-ahead to the go-astern direction. The "Queen" was built for the Southeastern and Chatham Railway Company, for the Calais-Dover route, which forms an important link in the through service between London and Paris. On her first trip across the Channel, above referred to, she maintained an average speed of twenty-two knots an hour, and at times ran considerably over that speed. On board the vessel were the Hon. Charles Parsons, the inventor and designer of her turbines, Col. Denny, the builder, and several American guests. According to Mr. Parsons, the cost of the ship was about $425,000, or practically the same as that of a vessel of her size fitted with reciprocating engines. The great advantage of the turbine installation is that there is a great reduction in weight and space for a given output of power on the propeller shafts. In the present case, from the foundations to the top of the turbine it is only six feet, whereas reciprocating engines of the same power would require about three times as much height to clear them. The expense of overhauls, which have to be very frequent on reciprocating engines, is practically eliminated on the turbine engines, the "King Edward" during the few years that she has been in service on the Clyde having cost practically nothing for repairs.

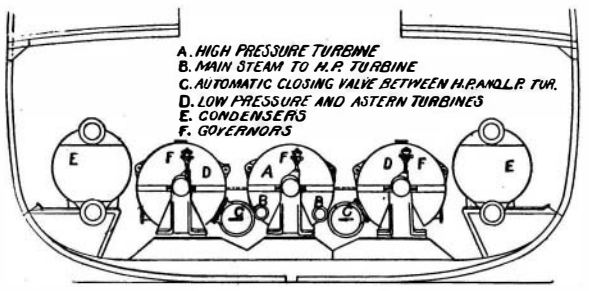


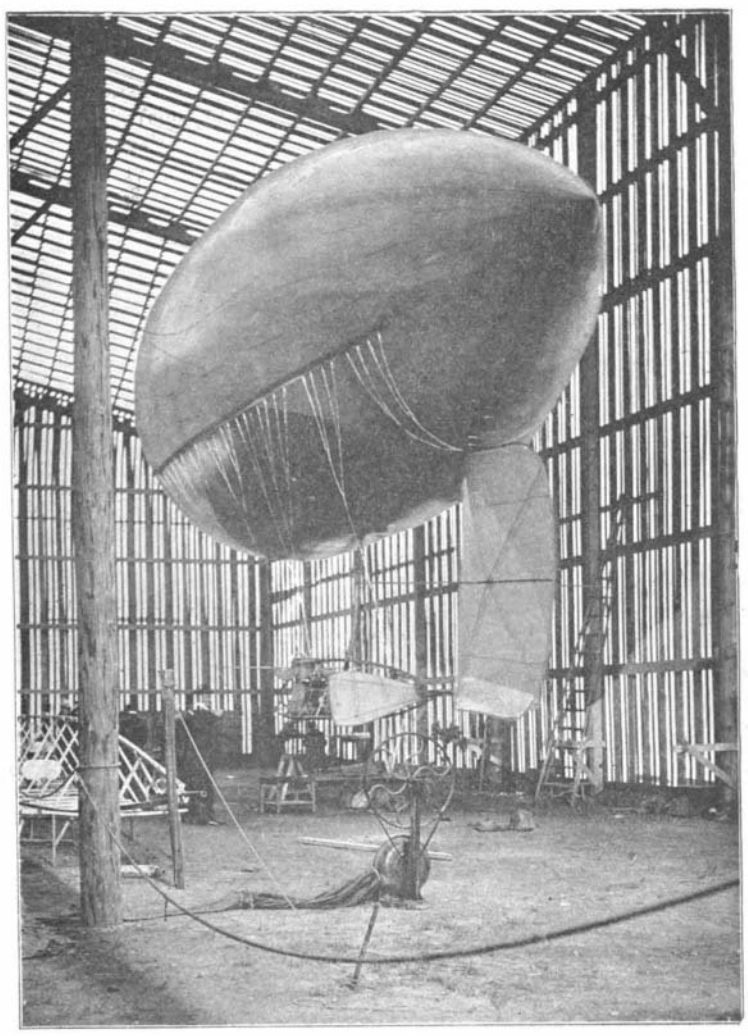
DIAGRAM SHOWING POSITION OF TURBINES.

Now that the turbine has been successfully installed on deep-sea channel service, the next natural step will be the construction of a transatlantic steamer with turbine motive power. Mr. Parsons affirmed on the occasion of the trial trip of the "Queen" that all the advantages shown by the turbine in river and channel steamers, will be realized in an increased ratio on the larger vessels for ocean service. This is a perfectly reasonable expectation. Turbines of 10,000 horse power are now being built, and will shortly be installed for electrical power station work, and there would be no theoretical or mechanical difficulty encountered in the installation of three or more turbines of similar size on a fast ocean liner; while the reduction in dead weight and the additional space that could be devoted to passenger accommodation would be very considerable.

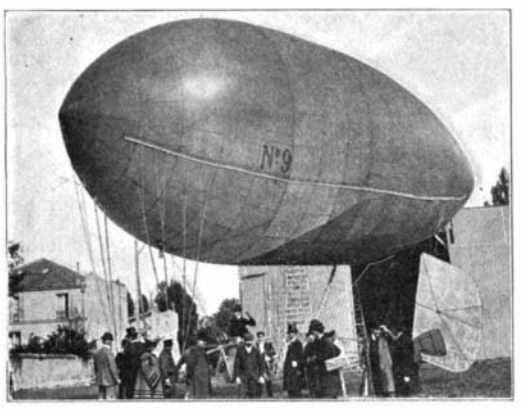
THE NEW SANTOS-DUMONT AIRSHIPS.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

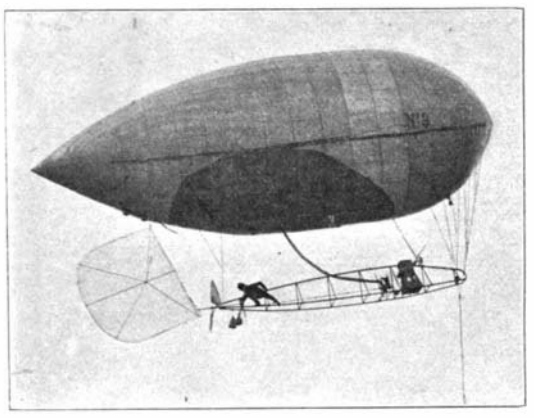
Santos-Dumont's new airship, the No. 9, has been tried in the neighborhood of Paris with considerable success. The tests thus far made may be considered as experiments with the new egg-shaped form of balloon before building a larger airship on the same plan. The vessel is the smallest airship ever built. Its gas capacity is only 340 cubic yards. On the 8th of May the new airship started from the balloon shed and sailed over the maneuvering grounds of the Bois



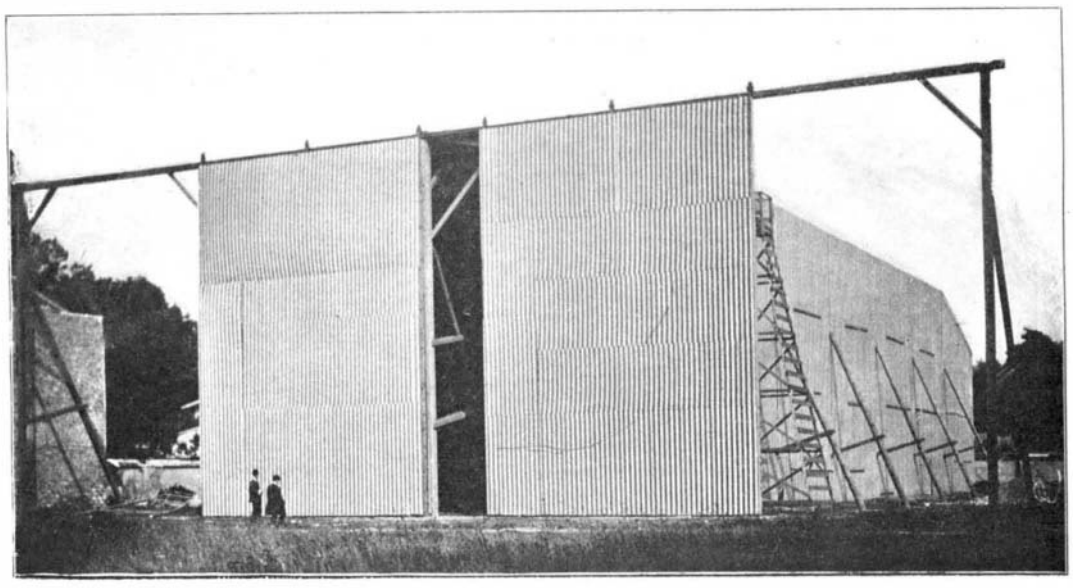
Interior of the New Shed, Showing the No. 9 and the Framework of the New St. Louis Racer.



Ready for the Start.



Santos-Dumont Shifting the Ballast-Bags.



Santos-Dumont's New Balloon Shed.

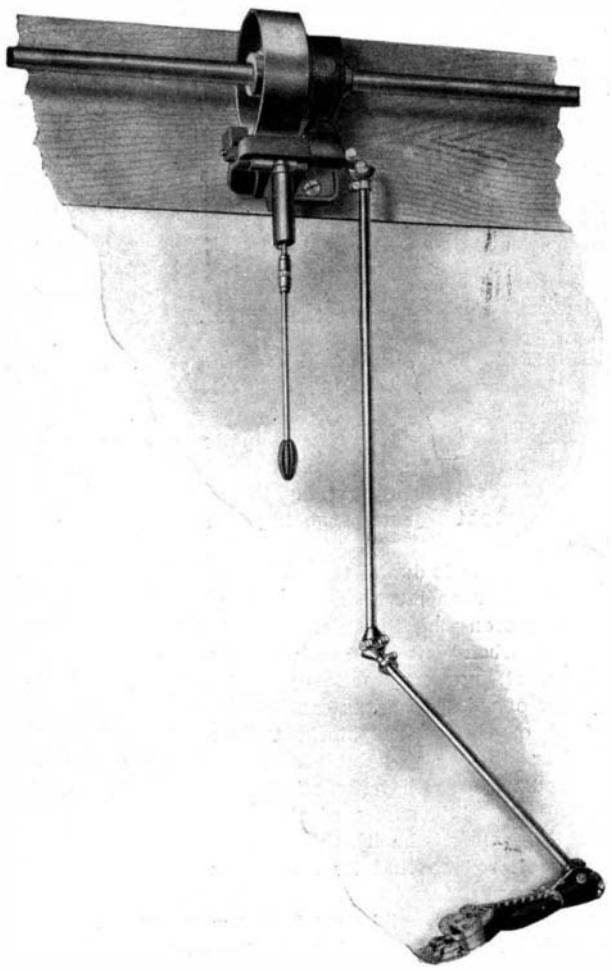
THE SANTOS-DUMONT NO. 9 AND ITS SHED.

de Boulogne, carrying a trail rope 100 feet long. The balloon could be steered with ease and went through a number of evolutions, going first in one direction, then in the opposite, turning about and traveling against the wind, rising and descending, and seeming to be fully under the control of the aeronaut. A second series of trials similar to the first were made on the 21st of May over the same ground and lasted an hour and a half. After sailing in different directions the airship alighted on the grounds of the Polo Club, taking its flight again, and after another series of evolutions, in which it was controlled with ease, it landed finally near the balloon shed. One of the engravings shows the airship ready to start from the balloon shed on its trial trip, with Santos-Dumont in the car, while the second shows it sailing over the Bois de Boulogne, the aeronaut being shown in the act of shifting the sand-bags which are used to balance the car. The position of the propeller and the rudder will be clearly observed.

The new No. 9, which was described at the time of its construction (in the SCIENTIFIC AMERICAN of December 20, 1902) is not intended to make any great speed, as the balloon body is of egg-shaped form and travels with the large end foremost. This construction makes it steadier than the pointed form. Hence the balloon is not as likely to pitch. The experimental No. 9 having proved so successful, the new No. 10, which is to be the largest airship yet built, and which will carry ten persons, will be constructed on the same lines.

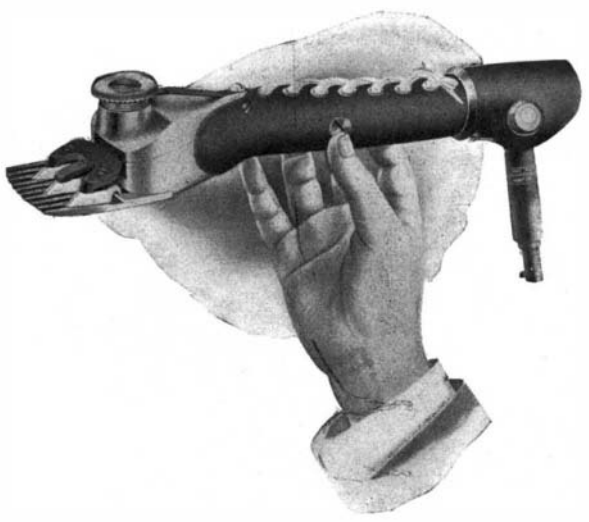
Santos-Dumont has erected a vast balloon shed on the bank of the Seine just outside the city. It consists of a framework of beams covered at the sides as well as the top with a red and white striped awning. One feature is the ease with which the front may be opened to let out the airships. The two frames which form the sliding doors and uncover the whole end of the shed are mounted on rollers upon an upper framework, and are guided below on rollers, so that they can be easily slid back and forth. In our engraving the aeronaut will be noticed in front of the shed, on the extreme left.

The new Clement gasoline motor used on the No. 9 has proved especially satisfactory. The little motor with its two cylinders joined in the form of a V to a round aluminium crank box, seems like a toy and weighs but 26½ pounds, although it will develop 3 horse power. The weight per horse power (8.8 pounds), the smallest that has yet been reached, is the result of a long experience in racing cars, where



SHEARER DRIVEN FROM AN OVERHEAD SHAFT.

the weight must be cut down to the minimum. Current for the spark is supplied by a battery and induction coil of the motor-bicycle pattern. The motor is connected through a light friction clutch to the long shaft which passes back of the propeller. A bicycle wheel with a heavy rim (without the tire) forms the flywheel and lies next the motor. The main framework remains about the same, but has been shortened by about two feet at the front end and is now rounded off. The position of the gasoline tank (containing 2½ gallons) has been changed, and is now hung on the rear of the basket. The rudder is formed of canvas stretched on a very light bamboo framework and measures about 10 feet square. The pilot wheel which controls the rudder is mounted just in front of the basket, and on the same shaft is a second and smaller grooved wheel carrying the cord which mounts up to the balloon body and then passes back over a set of pulleys to the rudder. The wheels are of aluminium, as in fact are most of the metal parts outside of the motor cylinders, and main shaft. The aeronaut has also at hand the cord of the escape valve as well



THE CLIPPER.

as the different levers for operating the motor. An air-bag of 60 cubic yards lies along the inside of the balloon at the bottom, forming a pocket which can be filled out with air by a fan mounted on the motor shaft. The balloon is always kept in shape as the gas escapes. The propeller, 12 feet in diameter, makes 200 revolutions per minute. The balloon body is only 45 feet long, while the framework is now but 27 feet. The complete airship weighs only 200 pounds.

Alongside the balloon shed has been installed a hydrogen generator of large capacity to be used for this and the future balloons. Tubes of compressed hydrogen are at hand for emergencies. One of the engravings shows the inside of the balloon shed with the No. 9. The shed will soon contain as many as three new airships, as Santos-Dumont is now building two new ones, the large No. 10 which is to be a touring balloon, and the new racer No. 7 with which he is to enter the St. Louis contest of next year.

The work on the No. 7 is already well advanced. The car which is 97 feet long is almost finished and will be observed on the left. The design of the new racer is almost entirely fixed upon. It will have a capacity of 1,650 cubic yards and will have the form of an elongated ellipsoid measuring 159 feet long and 23 feet across the middle, thus giving a ratio of 1 to 7. The two ends will be pointed. The envelop of the balloon will have 850 square yards surface. It is composed of two thicknesses of French silk pasted together and the whole will weigh 528 pounds. The balloon is divided into three compartments each having a volume of 550 cubic yards. The two partitions, which are of unvarnished silk, have a surface of 75 square yards and weigh 15 pounds. Near the center of the balloon are two interior air-bags of unequal size and communicating with each other by a canvas sleeve. The surface of the air-bags is 150 square yards and their weight 62 pounds. The car-frame, 67 feet long and 4 feet high in the middle, will be suspended from the balloon by 102 steel wires. A Clement petrol motor of 60 horse power will drive two propellers of 12 feet diameter, both having the same screw pitch. The propellers will be fixed at the front and rear of the car-frame. The basket of the aeronaut will be placed in the center of the car-frame. This new arrangement will tend to increase the pitching of the airship, and to overcome this, two pairs of horizontal planes will be placed to the forward and rear of the center of the framework, each lying on one side of the axis. These planes will measure 6 by 6 feet or 36 square feet each, or in all 144 square feet; they are to be movable and will be controlled by a set of levers. The rudder, whose axis will be vertical, will have a surface of 10 square yards. It is expected that the new racing balloon will make a speed of 60 feet or more per second. Santos-Dumont expects to finish it about the first of July, when it will be put through its trial tests.

A MECHANICAL SHEEP-SHEARER.

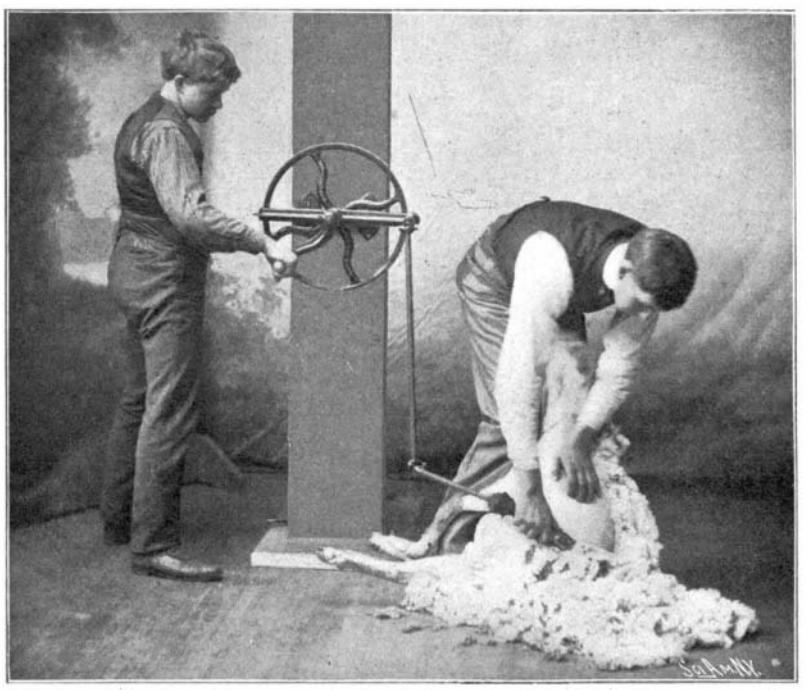
Among the variety of labor-saving apparatus which have been invented in recent years for the benefit of the farmer, one of the most interesting machines is that which relieves him of the work of removing the fleece of his sheep by means of the ordinary hand shears. A mechanism is now being used on the sheep farms of the West as well as other portions of the United States which performs a remarkable amount of work when contrasted with the method which has been used in the past. It works by means of a flexible shaft. The knives or shears can be operated as rapidly as the gearing contained in the shaft can be moved.

The sheep-shearing machinery can be operated by hand, by steam, or electric power, as desired. The cutting instrument proper is quite similar to the familiar clipper used by hair dressers and also for clipping horses, but varies in size according to the requirements. It includes a steel comb for separating the wool and allowing the knives to sever it closely to the skin. The cutter consists of three teeth or blades bolted to the framework of the shears in such a manner that they play freely, as shown in the illustration. They can be removed readily for sharpening whenever necessary. The cutting apparatus is connected to the lower of a series of steel spindles incased in tubular sheaths. The upper spindle terminates in a cog wheel which engages the teeth of a similar wheel at the end of what might be called the driving shaft. When the apparatus is operated by steam or electric power, this shaft is belted to a pulley.

Where power is furnished by hand, a crank is used to turn a driving wheel. The rim of this bears a series of cogs whose teeth fit into the driving shaft connected with the flexible shaft. By turning the handle of the crank wheel, a man or a boy can furnish sufficient power to operate two shearing machines at once.

The operation of shearing is performed so rapidly by this method that the workman can remove the wool practically as fast as he can push the cutter through it. Usually the plan followed is to guide the shears with the right hand, holding the animal in proper position with the left hand and the knees. As a rule the wool is first removed from the lower portions of the body, gradually working up the sides in such a manner that the skin is prevented from wrinkling and offers a smooth surface to the cutter. An expert shearer by this method can crop off the fleece almost completely, leaving the animal clean, as shown in the accompanying photograph. Some of the records made by expert shearers with the apparatus have been really remarkable, one man taking off 2,650 pounds of wool from 360 animals in less than 15 hours with such a cutter, shearing over 20 sheep per hour. The average shearer, after he has become familiar with the machinery, can without difficulty cut from 150 to 200 fleeces in a day of 10 hours.

Where a power plant is installed it is usually placed in a building large enough to carry shafting and pulleys, from which are suspended the shafts working the cutters. As a single cutter can be operated at full speed by ⅛ or 1-6 horse power, an engine of 8 or 10 horse power is sufficient to drive an extensive plant. One which has been installed on a ranch in Wyoming contains fifty machines, which have a capacity for shearing over 1,000 animals an hour. It is estimated that the entire expense, including labor, fuel for the engine, and wear and tear of the mechanism, averages between $20 and $25 for 100,000 head of sheep shorn, the average price paid the operator being



SHEARING A SHEEP BY HAND MACHINE.