A NEW WEATHER CANNON.

Ever since "weather shooting," as it is called in Germany and Switzerland, met with such pronounced success in Styria, upper Italy, Hungary, and France, meteorologists have been engaged in a very wordy battle as to the merits of the scheme. That something has been accomplished cannot be denied. Indeed, so successful have been the efforts in preventing hailstorms in upper Italy that since the experiments of 1898 some twenty thousand stations have been established. At the Agricultural Congress held in Padua last November by far the greater number of the members were in favor of the building of "weather-shooting" stations. The congress was very decidedly impressed by an account of one of last summer's hailstorms in the vicinity of Vicenza. So violent was this particular storm, the story runs, that for miles the land was completely devastated. But in this ravaged section, one spot was spared, because there it is asserted a number of stations had been located which had warded off the danger.

The shooting apparatus hitherto used has been very primitive in construction. For a cannon, a mortar with a funnel-like barrel was often used. In some places the funnel is fixed vertically in masonry. This method of mounting the cannon is not only crude, but also dangerous, for often enough serious accidents have occurred. In order to avoid these dangers as well as to improve the apparatus in general a Hungarian editor named Kanitz has devised a simple form of cannon which is essentially a breech-loading mortar

THE KANITZ WEATHER GUN

some thirty feet in length. The mortar is journaled in a rotatable carriage, so that it can be raised and lowered and swung from side to side. The charge is a metallic cartridge of blasting powder. After the discharge a loud, shrill whistling is heard, lasting for about fourteen or fifteen seconds. French and Italian wine-growers insist that by means of the gun clouds are torn asunder, so that rain instead of hail falls.

The grape growers of five departments of the French Alps have formed an alliance for buying cannon and powder for next summer. The Italian government has such faith in weather-shooting that it supplies wine-growers with powder at the rate of three cents a pound.

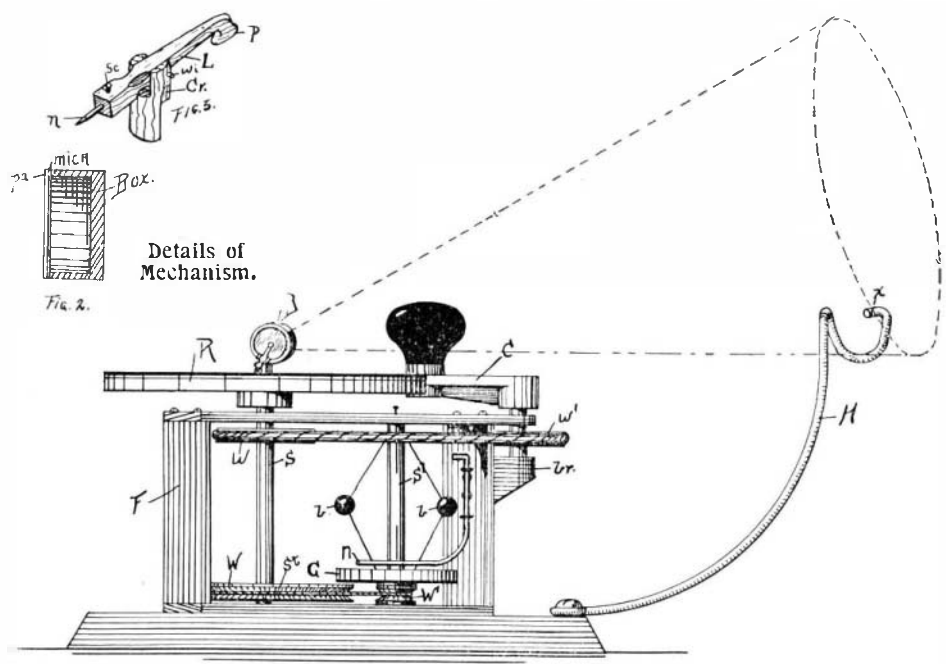
HOW TO MAKE A GRAMOPHONE.

BY WILL. B. STOUT.

A gramophone which will produce very good results with the ordinary gramophone records may be made, with very little work, by any one who can use a jackknife. It costs nothing, except for the record, and will certainly repay any boy or man who will spend a few hours making it.

As shown in the drawings, it consists principally of two parts; one for rotating the disk or record, and the reproducing part. The disk or record is supported on the circular piece, *R*, cut from half or three-eighths-inch pine, and mounted on the shaft, *s*, which, in turn, revolves in the wooden frame, *F*, which is of half-inch pine, an inch and a half wide. On the shaft, *s*, are also two pulley wheels, *w* and *W*, the former two inches in diameter, and the latter three and a half, both grooved to receive a round belt. These, too, may be cut from half-inch pine. The smaller wheel, *w*, is mounted just below the upper crosspiece of the frame, the larger one, *W*, just above the lower crosspiece, as shown.

The governor, which is mounted next to the record axle, but far enough away in the frame to clear the wheel, *W*, consists of a shaft, s^1, with the three-quarter-inch pulley, W^1, cut on it, on which is mounted a wheel, *G*, rimmed with a strip of lead from an old lead pipe. This wheel fits loosely on the axle, s^1, so that it can slide freely up and down on it. The lead rim should be at least an eighth of an inch thick and half an inch wide, or the width of the wheel, *G*. Running through two awl holes a quarter of an inch from the axle, s^1, in the wheel, *G*, is a string or small wire, as shown, which runs at the top through an awl hole driven crosswise through the axle, s^1. On this string, which is fastened from slipping through the awl holes in the wheel, *G*, by knots, are two split shot or fish-line sinkers. When the shaft, s^1, is revolved, the balls, *b*, fly out, and, when sufficient speed has been reached, lift the weighted wheel, *G*, till it presses on the wire stop, *n*. This stop is a loop of wire, fastened to the side of the frame so as to be adjustable up and down to regulate the speed. At the opposite end of the frame to the disk, or record axle, *s*, is mounted a second two-inch pulley wheel, w^1, between an extension of the upper crosspiece and a small wooden bracket, *br*. It is connected with the pulley, *w*, by a belt, and is turned by means of a crank, *C*. The pulley, *W*, is also connected with the governor pulley, W^1, by a waxed string pulley belt, *St*. By this means, when the crank, *C*, is turned, the wheel, *w*, is turned through the medium of the belt connecting the pulleys, *w* and w^1. Thus the pulley, *W*, is turned, and, in turn, the pulley, W^1, and axle and governor, as shown, the governor regulating the speed. The upper part, or surface, of the wheel, *G*, should have glued upon it a piece of flannel, to prevent undue noise when the wire, *n*, rubs upon it, and to increase the friction. The disk, *B*, should run as true as possible, and the axle should project up through it a quarter of an inch, and be as large around as the size of the central hole in the record. A record is seven inches in diameter. The sound-reproducing part consists principally of the "sounding box" and its lever, and the horn. The box may be an old wooden pill box, or may be cut from inch pine. It should be circular, about an inch and a half in diameter, inside measurement, and an inch deep. If cut of inch pine the central hole will be cut clear through the piece and a quarter-inch backing, or bottom of the box glued on. A three-quarter-inch hole is drilled in one side of the box to receive the horn. To the front of the box is glued a thin diaphragm of isinglass, outside of which is glued a paper ring, or washer, as large as the rim of the box. The writer used one machine for a while which had a tight paper diaphragm; but the isinglass is better. The box is shown in section in Fig. 2. The lever (Fig. 3) is cut out of hard wood in the shape shown; the distance from the wire axle, *wi*, to the center of the part, *p*, being the radius of the box outside. The other end of the lever is a trifle shorter than the inner end, and holds at its end the needle, *n*, in a small awl hole. This needle is held



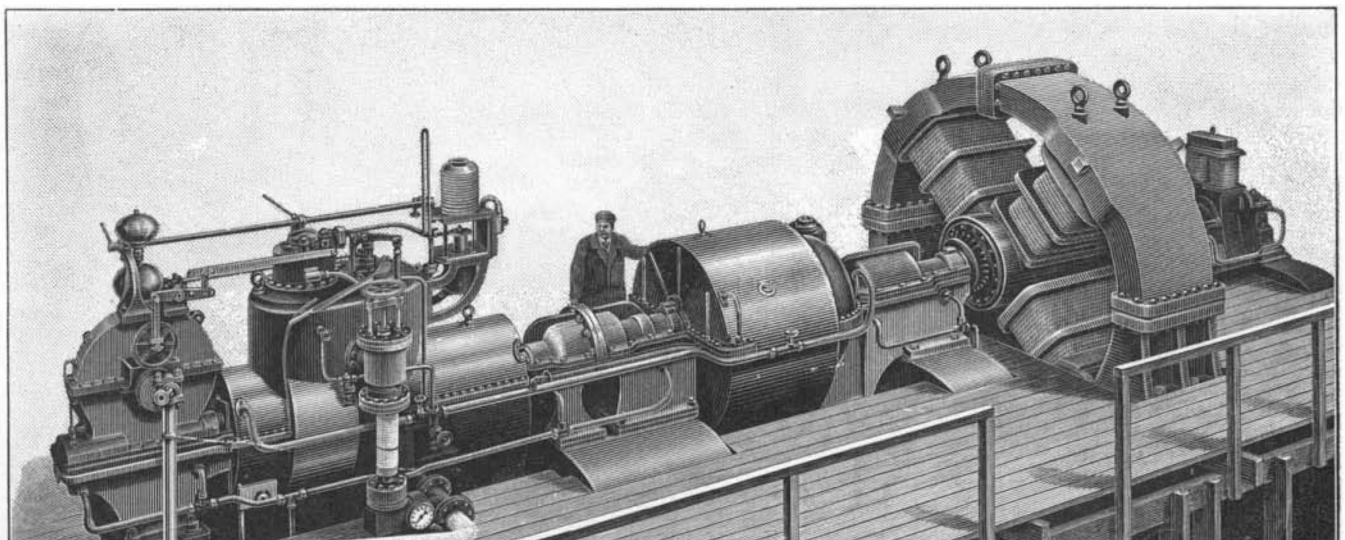
A HOME-MADE GRAMOPHONE.

in place by a small screw, *Sc*, so that its projection from the wood may be adjusted till the clearest effect is produced. The lever is mounted in a crotch, *Cr*, cut also from hard wood, the axle, *wi*, being a wire. The crotch part is glued on to the side of the box at an angle of about 120 deg., with the hole already cut to receive the horn, the part, *p*, of the lever being fastened to the center of the mica or isinglass diaphragm with glue or sealing wax. The horn, which may be made of stiff bristol board or tin, is now thrust into the hole in the side of the box or, better, fastened to the outside, so as not to obstruct the hole. If of pasteboard it may be glued in place by slitting the end and gluing on the flaps thus made. If of tin it may be soldered to a tin ring or band surrounding the box, or the flaps may be fastened on with brads.

The disk-turning mechanism is now fastened cornerwise on a wooden baseboard and a wire holder, *H*, fastened with a screw to one corner. This should reach up a little higher than the level of the record, but this may be adjusted by bending the wire. Also the distance from the needle to the guard may be adjusted in the same way till the right weight rests on the needle. A short "hook," as at *x*, may project in through a hole in the horn or funnel to keep it from turning. When all is ready put on your record, with the needle resting in its groove at the outside edge, and turn the crank. You will find by experiment how best to adjust the different adjustable parts to get the best results, but you will be surprised at the results you obtain with the crudest made machine. While not up to a machine-made product, yet it is not far behind, and for the satisfaction to the maker for the time spent in its manufacture, it "can't be beat."

PARSONS 1,000-K W. TURBINE AND ALTERNATOR.

We illustrate a 1,000-kilowatt turbine and alternator, one of two built by C. A. Parsons & Co., of Newcastle,



PARSONS 1,000-K. W. STEAM TURBINE AND ALTERNATOR AT ELBERFELD, GERMANY.

Steam consumption on test equivalent to 11.9 pounds per indicated horse power per hour.

England, for the Electrical Supply Works of the city of Elberfeld, Germany. Before shipment one of the sets was tested by W. H. Lindley, M. Inst. C.E.; Herr M. Schröter, Professor of Mechanical Engineering at the Politechnicum, Munich, and Dr. H. F. Weber, Professor of Physics at the Politechnicum, Zurich. From the report we learn the following facts:

The specification required that each machine should have an output of 1,000 kilowatts useful effect at 4,000 volts, and with 50 complete cycles per second. The speed of the turbine was to be 1,500 revolutions per minute, and the admission of steam to the steam-chest to be once in each eight revolutions of the turbine, or 187.5 admissions per minute, so as to synchronize with the revolution of the reciprocating engine. The steam consumption was defined as follows: With at least eleven atmospheres absolute pressure, and 50 deg. Cent. (90 deg. Fahr.) superheat of steam at the stop valve, and with circulating water of not more than 18 deg. Cent., supplied at the rate of 430 cubic meters per hour for full load, the steam consumption per net kilowatt-hour, measured in the alternating current at switchboard, shall not exceed 24¼ pounds at full load, 24.9 pounds at three-quarter load, 25.45 pounds at half load and 30.8 pounds at quarter load. The consumption of steam at no load shall not exceed 2,337 pounds per hour.

The tests were made with an average superheat of 14.3 deg. Cent. (25.7 deg. Fahr.), instead of 50 deg. Cent. (90 deg. Fahr.) as stipulated for, and consequently somewhat better figures might have been attained under more favorable conditions.

When the figures are corrected to the average superheat of 12.3 deg. Cent., they stand as in Table II.

It will be seen that Messrs. Parsons exceeded their guarantee very considerably, except at quarter load. At full load they were 4 pounds below the stipulated amount.

The average variation of speed when the load was gradually altered from nothing to full, and vice versa, was 3.6 per cent. When a part of the load varying from 16 to 63 per cent was suddenly switched off, and the regulation was entrusted to the centrifugal governor, the revolutions varied from 1 to 1.9 per cent immediately after the sudden change of load, while the permanent variation in speed amounted to from 0.4 per cent to 1.3 per cent. The electrical governor, under similar conditions, kept the average variation of potential within 1.1 per cent of the initial potential. Between no load and full load the drop of potential on a non-inductive load was only 1.02 per cent, or 20 per cent of that permitted by the speed. The drop of potential with inductive load amounted to 11 per cent between no load and 1,000 kilowatts.

TABLE I.—STEAM TRIALS OF TURBINE AND ALTERNATORS.

	Exact Value of Output in Kilowatts.	Steam Consumption per Kilowatt hour.		Steam Consumption in One hour.
		pounds.	kilogs.	kilogs.
Preliminary trial.	1172.7	18.22	8.26	9,689
Overload	1190.1	19 43	8.81	10,485
Normal load	994.8	20.15	9.14	9,092
Three-quarter load.......	745 3	22.31	10.12	7,542
Half load.	498.7	25.20	11.42	5,695
Quarter load.............	240.5	33.76	15.31	3,774
No load with alternator excited.....	0	....	....	1,844
No load without excitation..................	0	....	....	1,183

These results are superior to any that have been achieved by reciprocating engines. In a letter to the SCIENTIFIC AMERICAN, published in our issue of January 12, 1901, Mr. Parsons quoted Profs. Schröter and Weber as saying:

"At the overload of 1,200 kilowatts, and with a steam pressure of 130 pounds at the engine, and 10 deg. Cent. of superheat, the engine driving its own air pumps, the consumption of steam was found to be at the rate of 18.8 pounds per kilowatt hour. To compare this figure with those obtained with ordinary piston engines of the highest recorded efficiencies, and assuming the highest record with which we are acquainted of the ratio of electrical output to the power indicated in the steam engine, namely, 85 per cent, the figure of 18.8 pounds per kilowatt in the turbine plant is equivalent to a consumption of 11.9 pounds per indicated horse power, a result surpassing the records of the best steam engines in the production of electricity from steam under the conditions named."

For the original from which our engraving is made we are indebted to Engineering, of London.

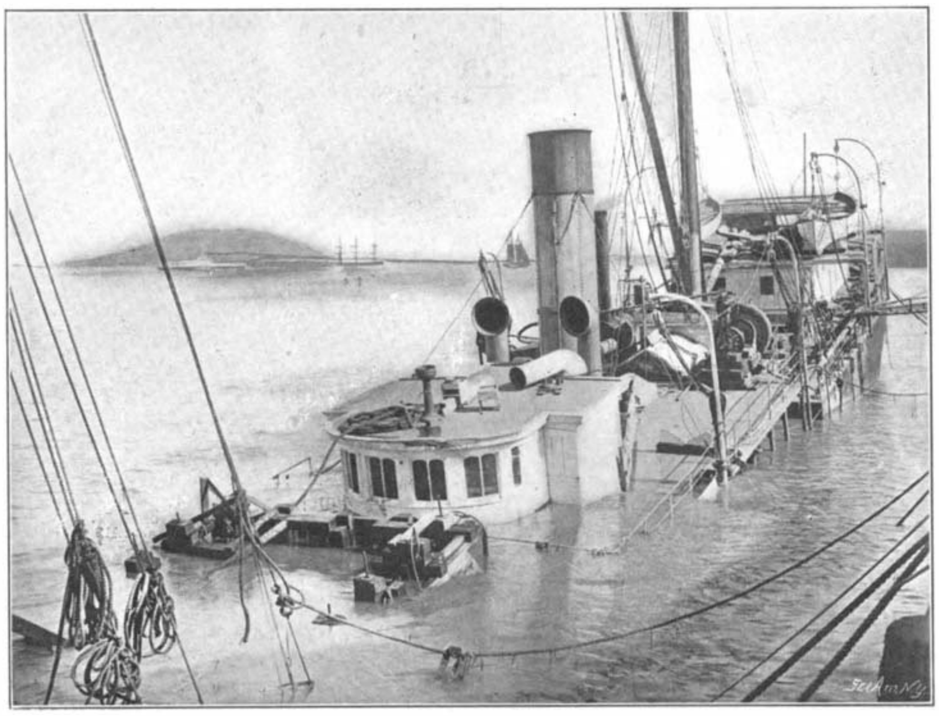
RAISING A SUBMERGED STEAMSHIP.

The first-class iron steamship "South Portland," 200 feet in length, with a carrying capacity of 1,000 tons, arrived in San Francisco on February 5, 1901, with upward of 600 tons of lime, in barrels, in the hold. Proceeding to the seawall, the unshipping of the cargo was promptly undertaken; but when it was about completed it was discovered that fire, started by the lime, had taken hold and was spreading rapidly through the vessel. At that time there remained on board 2,000 barrels. Engines were summoned and water in large quantities was poured into the burning vessel. To the amazement of the spectators, and contrary to all expectations, the bow of the steamer began to sink, and before any attempts to prevent such an unlooked-for event could be taken the forward portion was submerged and sank in 40 feet of water. A wrecker was promptly summoned, who first directed his efforts to sustaining the portion aft which remained above the tide. This was successfully accomplished, and the best mode of preventing the ingress of water to the part submerged was then considered. Two coffer dams to cover the forward hatches were constructed, one 18 feet high, 23 feet long, and 14 feet 5 inches wide, and the other 18 feet high, 12 feet long and 10 feet wide, and secured over the deck openings. Then seven pumps, having a capacity of 71 tons a minute, were set to work, and the process of emptying the vessel began. Either the deck was too weak to sustain the weight of the coffer dams or the pressure from the water above was more than the frame of the vessel could endure, but in any event the deck between the coffer dams collapsed, and the recovery of the vessel seemed farther off than before. The two dams were taken away and replaced by one which covered the entire forward part of the deck, being 18 feet high, 54 feet long, and 24 feet wide. Pumps throwing 54 tons of water per minute were started, and in 40 minutes the "South Portland" was high and dry. At low tide the bow was 17 feet under water. The damage to the steamer was not great.

THE STEAMSHIP "SOUTH PORTLAND" WITH COFFER DAM.

TABLE II.

Load.	Guarantee at 50 Deg. Superheat.	Consumption at 14.3 Deg. Superheat.		Difference.
kw.	kilo. per kw. hour.	kilos. per kw. hour.	lb.	kilos. per kw. hour.
1250	....	8.63	19.0	
1000	11.0	9.19	20.2	— 1.81
750	11.3	9.99	22.0	— 1.31
500	12.0	11.41	25.1	— 0.59
250	14.0	15.28	33.7	+ 1.28
No load				



THE STEAMSHIP "SOUTH PORTLAND" AFTER SINKING.

The Latest German Quick-Firing Field Gun.

Profiting by their experiences of the war in South Africa, the British government is pushing forward its scheme for the rearming of the army. The initial step has been taken by ordering 120 of the new quick-firing Ehrhardt guns, which, with the exception of the latest Elswick gun, is the most efficient arm for field artillery. The Ehrhardt guns are of two calibers—the fourteen-pounder, which fires a projectile slightly under three inches in diameter, called by its inventor the "normal gun," and another which carries a projectile slightly over three inches in diameter.

The Ehrhardt gun differs from the existing type of arms in the use of steel tubes, which are manufactured by a special process, instead of using solid metal for the carriage and mountings. By this means the minimum of lightness consistent with the maximum of strength is insured, and the handling of the piece is facilitated. The energy of the recoil is absorbed by a hydraulic brake.

The weight of the gun, without its carriage, is 8½ hundredweight; the carriage represents nearly 10¾ hundredweight, and the limber, with its complement of one hundred rounds of ammunition, about 30 hundredweight. The length of the barrel is 7 feet 7½ inches—thirty-one calibers.

The ballistic energy of the arm is great. A projectile weighing 14 pounds is discharged at a velocity of 1,740 feet per second. The velocity, however, decreases so gradually that at a range of 600 yards the aim is almost point blank. At 3,300 yards the velocity diminishes to 965 feet per second. With the larger gun even greater velocity is attained, resulting in a flatter trajectory of the projectile and greater accuracy in the aim. The powder employed is about one pound of a high explosive. The rapidity of fire is about sixteen shots per minute.

But it is claimed that the greatest effect obtained with this arm is in the discharging of shrapnel. The Ehrhardt shrapnel shell is formed out of white-hot, solid steel, and then drawn through successive narrow rings to toughen the metal and to render it more elastic. Each shell is filled with 300 bullets, each weighing about a third of an ounce. The fuses are regulated by hand, without any mechanical assistance, the burning period being 20 seconds, sufficient to make them effective at a range of about 6,000 yards. It is claimed that the maximum rapidity of fire with shrapnel would concentrate a ceaseless stream of 5,000 bullets a minute upon any desired area.

Public telephones will soon be installed on street corners in New Haven. They will somewhat resemble fire boxes. On each of the four sides is the well-known blue bell. The box is ordinarily locked, but is opened by dropping a coin into a slot. When the door is open the process of obtaining telephonic connection is the same as at any public pay station, the telephone list being hung against the door. When the receiver is hung up, the door shuts automatically.