DRURY LANE STAGE

ITS MACHINERY AND MECHANICAL EQUIPMENT.

THE name Drury Lane carries, with its host of memories, suggestions of wonderful stage settings, of mechanical effects such as are seldom attempted elsewhere, and of remarkable ingenuity applied to the production of startling and unique scenic displays. This record may be primarily attributed to the ability and enterprise of those responsible for its productions, ability and enterprise which have been strikingly manifested under the present régime by Mr. Arthur Collins, the able managing director. Without detracting in any way from the credit due to the enterprising management, it will none the less be understood that many of the results achieved have only been made possible by the great area of the stage and the complicated mechanical and electrical appliances with which it is equipped. Some description of this latter feature should be of much interest.

THE STAGE: ITS BRIDGES, RISING AND TILTING.

The most striking features of the machinery, and the ones which are likely first to attract the attention of a visitor below the stage, are the rising and tilting bridges which are shown in two of the illustrations accompanying this article. There are four bridges, each of which is about 40 ft. long and 6 ft. wide, and in their lowest position they are flush with the stage, and form part of its surface. As the bridges are situated one immediately next to another, they form an area of the stage of about 24 ft. by 40 ft., which is capable of being lifted vertically through a height of about 8 ft., carrying properties or people with it. Further, any of the four bridges may be raised or lowered independently of the others, while, in addition to the direct rising and falling, the two front bridges are capable of being tilted from either end, as shown in one of the illustrations. The possibility of combining these various movements in any way, each of the bridges being quite independent of any of the others, gives great flexibility for the arrangement of set-pieces or the production of effects. A very successful setting of some few years ago, in which canal boats rose and fell in their locks, was produced by means of these bridges. Such sensational scenes as the sinking of the Beachy Head in "Sins of Society" and the Alpine Pass scene in "The Marriages of Mayfair" are other examples of the possibilities they present. In "The Whip" their utility was not, perhaps, so strikingly illustrated, as the stage had to be made exceptionally firm. But in the first act one of the bridges was raised to permit of the motor-car accident, in which the hero obtained the mental oblivion which is the key to the drama.

The methods by which the various movements of the bridges are obtained are shown in some of the illustrations. The two back non-tilting bridges are lifted by electric power. They are provided with feet below the stage, and when in their lowest position—that is, when the top surface is level with the stage—these feet rest on foundations, so that a very steady and solid surface is obtained, on which heavy properties may be placed or moved about. When these two bridges are lifted they are hung by steel-wire ropes and counterbalanced by heavy weights, in exactly the same way that an ordinary window is balanced by weights inside the casement. These weights are situated against the walls of the building well out of the way, and the ropes connecting the bridges to them are guided by carrying them round suitable pulleys. Owing to this system of balancing the weights of the bridges, the electric motors which work them have only to lift the weight of any properties or people which they may be carrying, which enables much smaller motors, using less current, to be used than would be necessary if

the balance weights were done away with and the motors had to lift the actual weights of the bridges. This point would also be of great importance if the electric motors broke down and the bridges had to be wound up by hand, as the balancing, of course, greatly reduces the effort that would be required.

The Lifting Motors.

The lifting motors are situated in a motor-room, which is a fireproof brick building situated below the back of the stage. The interior of this room is shown in one of the illustrations, in which the two electric motors which serve to wind up the bridges will be seen at the right-hand side. There are two main spindles in the room, each of which has two drums, or barrels, fixed on to it, and on these barrels the wire ropes which lift the bridges are wound. The ropes wound on the barrels and leading away, through holes in the sides of the motor-room, to the bridges, can be seen in the illustration. It will be understood that as the main spindles, with their barrels, turn round, in one direction or the other, the wire ropes will either be wound up or let off, so that the ropes will either be pulled in or let out, and the bridges hauled up or lowered down. The spindles of the motors are fixed at right angles to the main spindles, and drive them round by means of toothed wheels. These wheels are made so that they will not drive backwards—that is, when the bridges have been lifted to any height their weight pulling on the ropes is not able to pull the main spindle round and turn the motors, so that the bridges will stop in any position to which they are lifted, and cannot be moved unless the motor switches are operated. Handles are fixed at the back of the barrels, so that if the electric motors break down men may be employed to wind up the bridges by hand. This method would be neither so quick nor so cheap as electric power, and is, of course, only intended to be used in case of an electric breakdown. The motors are started and stopped by switches and gear placed outside the motor-room, and close to the handles which control the two front bridges. The gear is arranged so that the motors may be driven in either direction. The motors are each of ten horse-power.

The Hydraulic Power.

The two front lifting and tilting bridges are driven by water power. Each bridge is carried at the top ends of two large plungers, or rams, which fit into iron cylinders standing vertically in pits dug in the foundations. High-pressure water pipes are connected to the bottoms of the cylinders, and arranged with taps or valves, so that when the taps are opened water flows into the bottoms of the cylinders and, being at high pressure, pushes the rams, or plungers, upwards, which rise and carry the bridges with them. As each of the two rams, carrying one bridge, are able to be worked independently of the other, it is possible to raise one end of the bridge without the other, or to raise the two ends to different heights, so that the bridge may be tilted in either direction. One of the illustrations shows the two bridges tilted in opposite directions, while another shows them lifted without tilting. These two views together show the great flexibility of the arrangement. One of the half-page illustrations shows the massive plungers below the stage. It will be understood that the bridges are fixed directly to the top of these plungers, and are not otherwise supported, and that the plungers carry the whole weight of the bridges, with any properties that may be placed on them.

The amount of lift of the plungers—that is, the amount of tilt of the bridges—is determined by the amount of water admitted to the cylinders. The amount of water is controlled by opening or closing the valves or taps which regulate the supply. The valves for each of the bridges are worked by two long handles, like the handles in a railway signal cabin, and a man can perfectly control the tilting or lifting of one of the bridges by holding these two handles, one in each hand, and moving them backwards and forwards as required. There are, of course, four of these handles in all, two for each bridge, and they may be clearly seen in one of the half-page illustrations. The lower illustration on the same page shows the taps or valves which control the water supply to the cylinders, and which are opened or closed by the handles. The valves are situated directly under the platform on which the man stands when working the handles, so that the relative positions of the valves and the handles are correctly shown by the relative positions of the two illustrations. In the lower picture the rods which come through the platform and connect the valves to the handles may be clearly seen. The water

which is used to lift the plungers is taken from the mains of the London Hydraulic Supply Company at a pressure of 800 lbs. to a square inch.

In the illustration which shows the operating handles an indicator may be seen on the right-hand side, immediately facing the man who is working the handles. This indicator is arranged to show to what height the two ends of a bridge have been lifted. It is much the same sort of thing as the indicators which are frequently fixed in office buildings to show the position of the lift cages to anyone waiting at any of the floors, and consists of small blocks or marks which travel up and down over numbered scales, one block corresponding to each end of a bridge, so that the position of the blocks at once shows the position of the bridges. Although the man who is working the handles can actually see the underside of the bridges, these indicators allow him to judge the amount of tilt more accurately, and to be sure that any bridge always takes up exactly the same position during every performance, for any scenic arrangement in which it may be used.

"The Whip" Production.

The apparatus shown in the small illustration which accompanies the view of the motor-room was specially installed for the performances of "The Whip," the autumn production of 1909. This apparatus was of a heavy and expensive character, and was designed and installed as carefully as if it were to form part of the permanent equipment. It illustrates the care and thoroughness with which all the mechanical arrangements at this theatre are carried out. The apparatus consists of electric motors and spindles, and was used in connection with the great Racecourse scene in act four. There are two motors, which can be seen at the left-hand side of the picture. The right-hand side one of the two, which is of 15 horse-power, drove the big panorama which served as background for the scene. The panorama was an endless one built up on a framework and carried by two vertical rollers the full height of the cloth. One of the rollers had a projecting spindle, which came through a hole in the stage, and was driven by the motor below. The motor on the extreme left, of 10 horse-power, drove the horizontal spindle which can be seen in the right-hand side of the picture, carried in bearings secured to the underside of the stage. The spindle, in turn, drove the horizontal bands which represented the grass in the scene, and between which the horses ran. In addition to the main panorama, forming the background, there were smaller side panoramas which were driven by electric motors fixed actually inside them. As evidence of the amount of work that is carried out for the adequate presentment of these productions, it may be mentioned that the whole of the stage was raised about one foot for this production in order to arrange for the horizontal travelling bands.

The Switchboard.

The motors for this Racecourse scene were started from the switchboard which controls the lighting of the whole of the stage, which is shown in one of the half-page illustrations. It is conveniently situated on the Prompt side of the stage. The switchboard contains three horizontal rows of switch handles, which correspond to the circuits for the red, white, and green lights respectively. All circuits are led through dimmers, so arranged that the lamps forming any circuit may be turned to any height from a mere red glow to full on. The dimmers consist of vessels containing water into which metal plates dip in such a way that as the plates are lifted out or lowered farther into the vessels, more or less of the current is absorbed by the water, so that the lamps are dimmed or brightened. The rows of handles controlling the dimmers can be seen in the illustration in the centre of the switchboard, directly behind Mr. Mather, the engineer.

At the right-hand side of the illustration of the switchboard the signal board may be seen, one of the switches of which is being operated by Mr. Ernest D'Auban, Drury Lane's well-known and popular stage manager. All signalling to the men controlling the lifting and tilting bridges, the men in the flies, etc., is done from this board by means of lamps. The electrical wiring is arranged so that as any of the signal switches is closed a small lamp lights up in the flies, or at any other point to which the signal is being sent, and at the same time a small lamp lights up on the signal board. It is impossible for a signal lamp at a distance to light up without the corresponding indicating lamp on the signal board also lighting, so that all signals sent out are immediately checked before the eyes of Mr. D'Auban, or whoever else may be at the switchboard, and mistakes are avoided. The positions of some of the signal lamps may be seen in the illus-

trations showing the motor-room, the flies, and the bridge operating gear. Metallic filament lamps are used throughout for the main lights, and there are twelve battens, each with 260 thirty-candle-power lamps. The square boxes at the extreme right of the illustration of the switchboard are the starters for the panorama motors. Current at 200 volts is used for all motors and at 100 volts for lighting, and the supply is taken from the Charing Cross, West End, and City Supply Company. There are two services installed, to prevent trouble in case of a breakdown on the mains, one current being taken from the special theatre mains and the other from the ordinary town supply.

The Flies.

The arrangement of the flies in this theatre is very convenient and excellent. There are two tiers of galleries. The upper of these galleries, which is used by the scene-shifters, is shown in one of the full-page illustrations. The lower gallery is reserved for the lime-light men, and it will be clear that this two-gallery arrangement allows great freedom of operation for the lime-light men, as they are not interfered with by other workmen, and have great freedom of movement in carrying on their work.

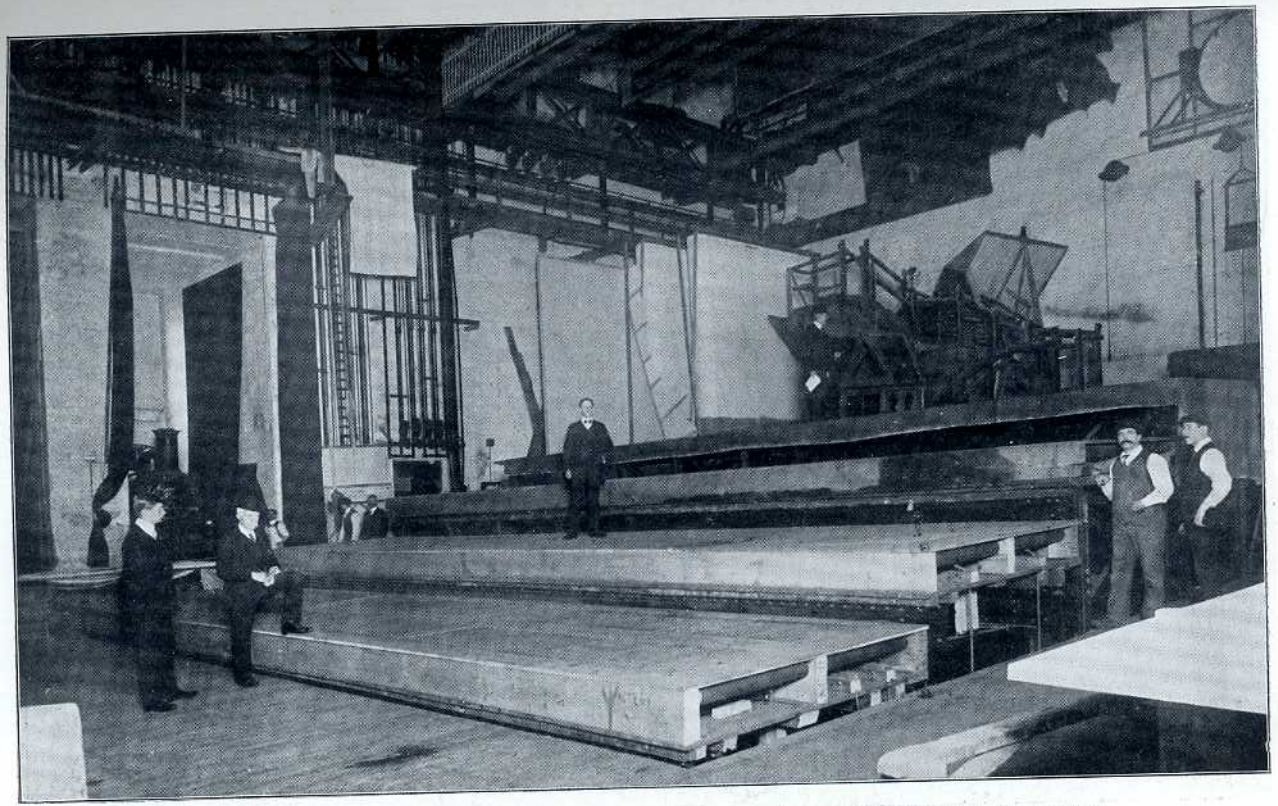
Oxygen and Hydrogen Gas Pipes.

The lime-light system is very interesting. Instead of the lamps being supplied from the heavy and awkward gas cylinders generally used, there are oxygen and hydrogen gas pipes laid throughout the stage and up to the galleries. These pipes are supplied from large gas holders placed in the basement, and which are periodically filled from the ordinary gas cylinders. A system is in use by which a steady pressure of about 2 lbs. to a square inch is maintained in the gas pipes by running water into the holders as required. The result of this is that very steady-burning flames are obtained in the lamps, with a complete absence of the flickering and spurting which is sometimes seen. The gas pipes are run in various directions under the stage and up to the galleries in the flies. A number of small traps are arranged in the stage leading to taps, to which connection can be made by a small piece of indiarubber tube, so that lamps may be temporarily placed in any convenient position. In order to minimise the likelihood of fires, all lamps are lit by means of portable electric gas-lighters, which does away with the necessity of using matches.

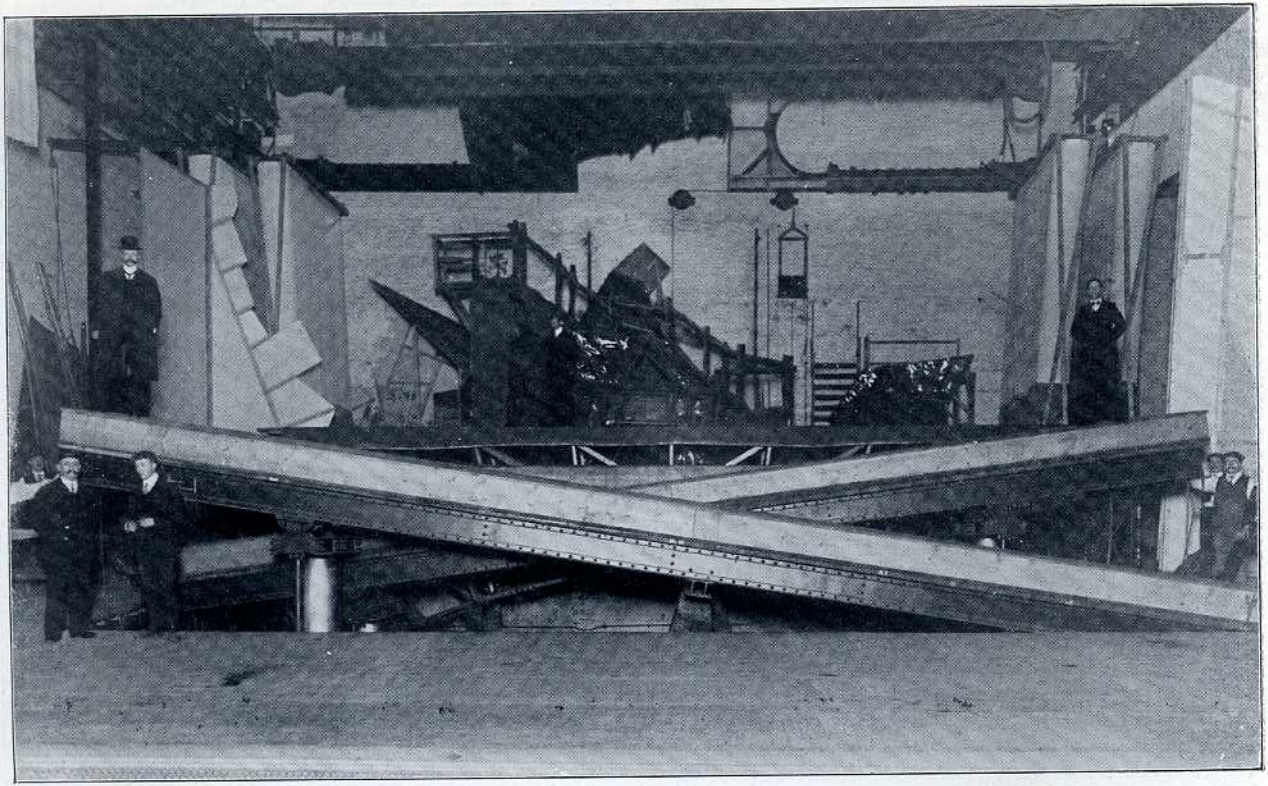
Ventilating and Heating.

All air entering the building is drawn in at the basement by means of a fan, driven by a 10 horse-power electric motor. It is taken in at the basement in order to avoid smoke and other impurities which are more prevalent in the air near the roof. Before entering the building the air is drawn through a large cylinder or roller which is covered with cloth, and is continually being turned round on its spindle. The lower part of the roller dips into a large bath containing an antiseptic solution, so that the cloth covering it is always wet. The result is that as all air entering the building must pass through this cloth covering the roller, it is filtered and disinfected, and enters the theatre in an absolutely pure state. After passing to the inside of the roller the air is warmed by being passed over pipes which are heated by steam from a special boiler. By varying the steam in the pipes any degree of heat may be given to the air, and the result of the whole arrangement is that absolutely pure air, heated to suit the weather at the time, is supplied to the theatre. The air finally passes into the building by ducts placed in the front of the stage. There are two installations, as described above, one supplying the stage and the other the auditorium. Foul air is extracted from the building by means of a fan driven by a 8½ horse-power motor placed above a grille in the auditorium immediately above the centre electrolier, so that there is a continual circulation of warm, pure air throughout the theatre.

Of the remaining two illustrations, one shows one of the property rooms, in which are some of the figures prepared for the Madame Tussaud's scene in act three of "The Whip." The other is from a photograph of Mr. Ernest D'Auban, the stage manager, in his room. Thanks are due to Mr. D'Auban for facilities and assistance given in the preparation of this description of the stage machinery of this famous theatre. Much assistance was also given by Mr. Mather, the engineer, who can be seen standing in the centre of the picture of the switchboard.



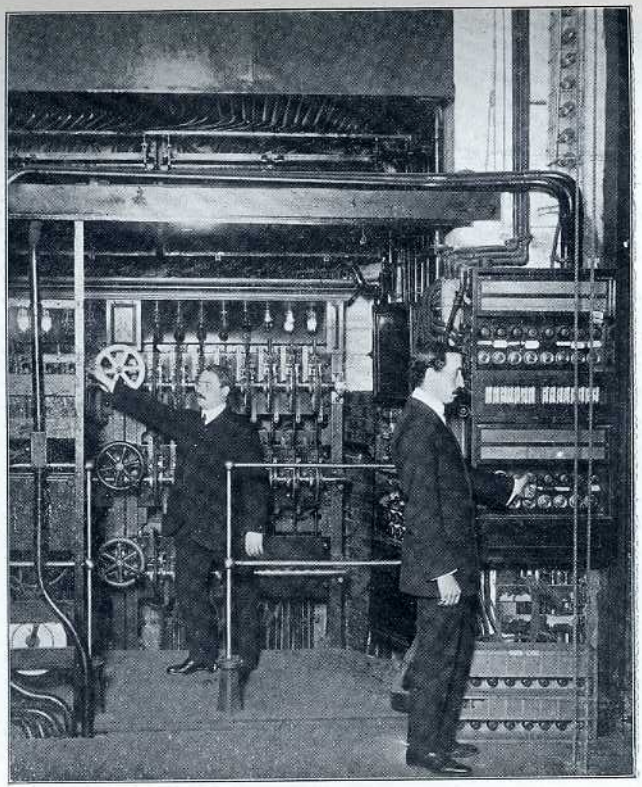
THE STAGE, SHOWING THE BRIDGES LIFTED TO DIFFERENT HEIGHTS.



THE STAGE, SHOWING A TILT ON THE FRONT BRIDGES

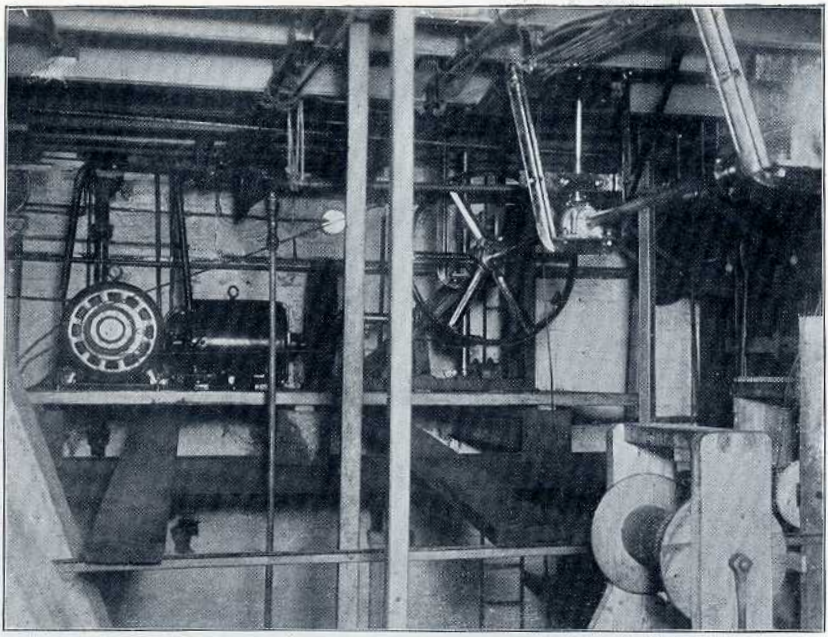
THE UNDERSIDE OF THE STAGE,

Showing the massive plungers.

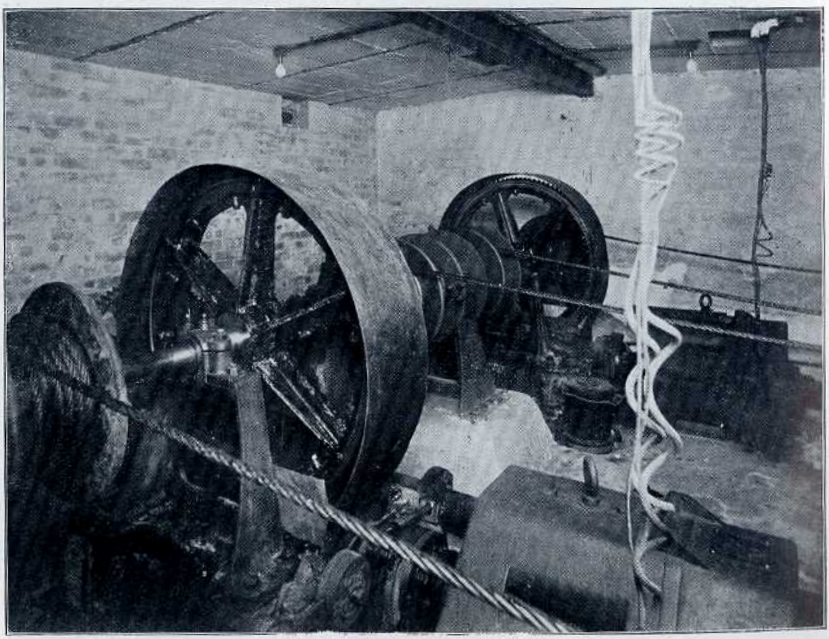


THE SWITCHBOARD

Which controls the lighting of the stage.



MOTORS AND SPINDLE UNDER THE STAGE
Which operate the panoramas for the Racecourse Scene.



THE MOTOR ROOM,
Showing the gear which operates the Lifting Bridges.