July 28, 1964 J. E. MINTY 3,142,387

FLYING ROPE CRANE

Filed Feb. 20, 1962 2 Sheets-Sheet 1

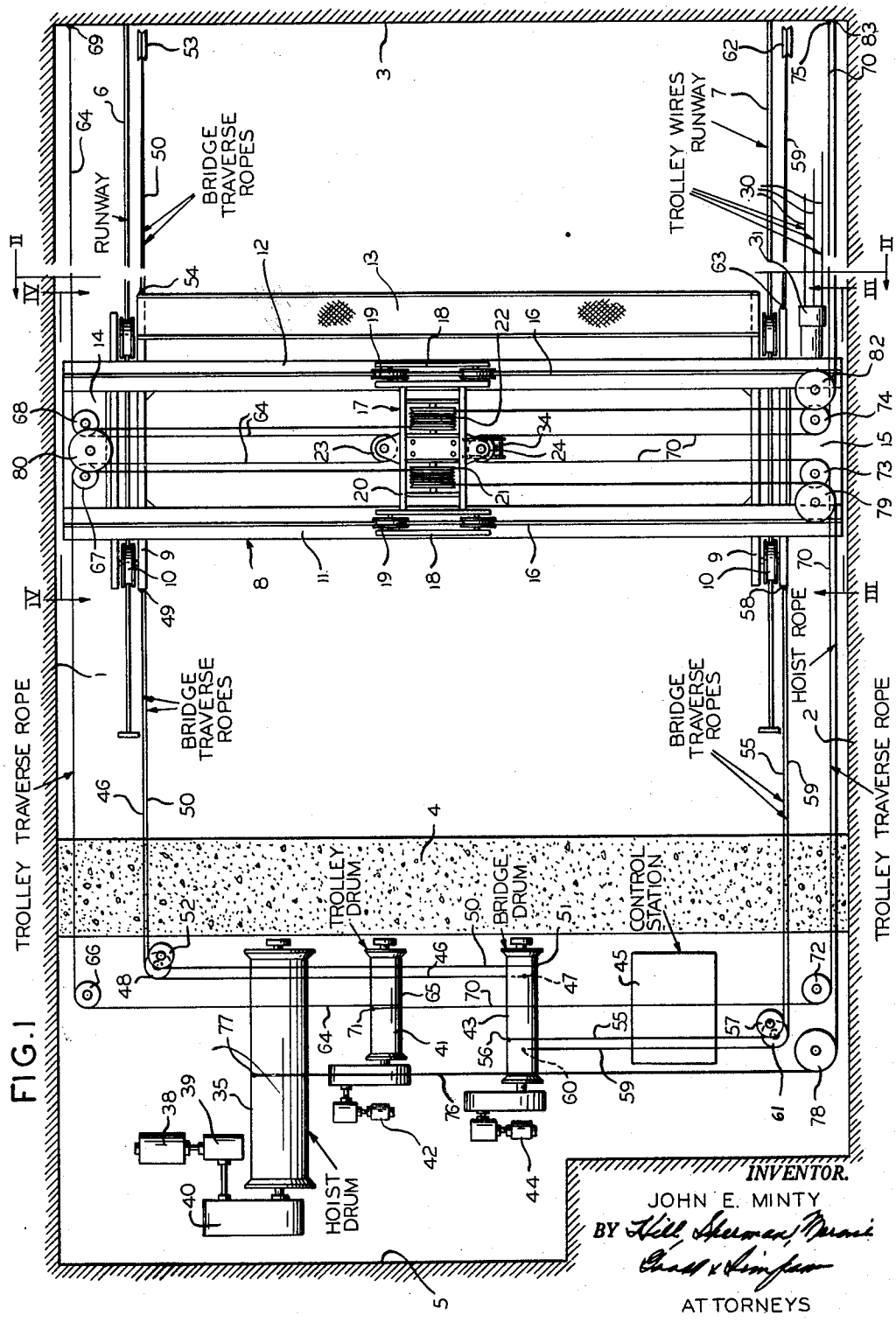


FIG. 1

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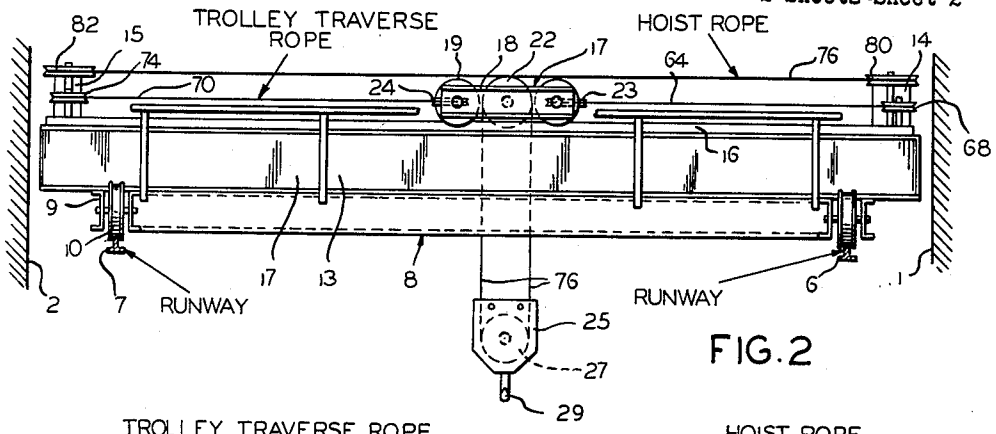


FIG. 2

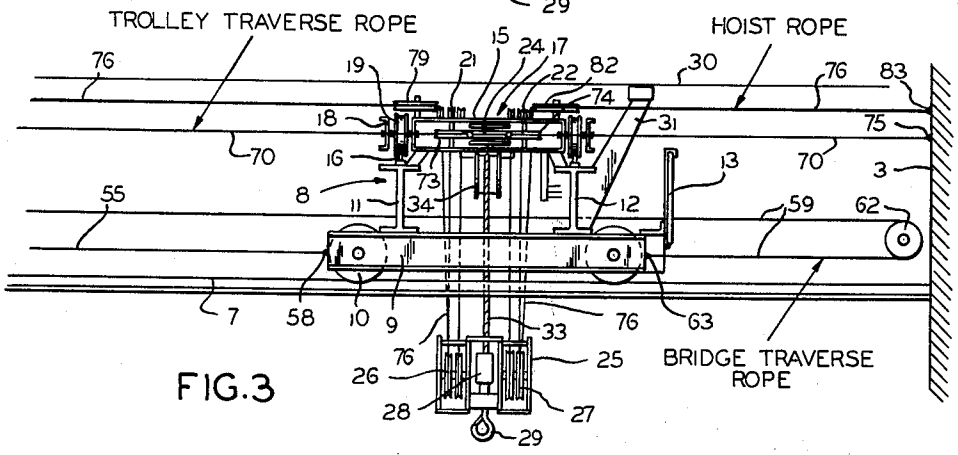


FIG. 3

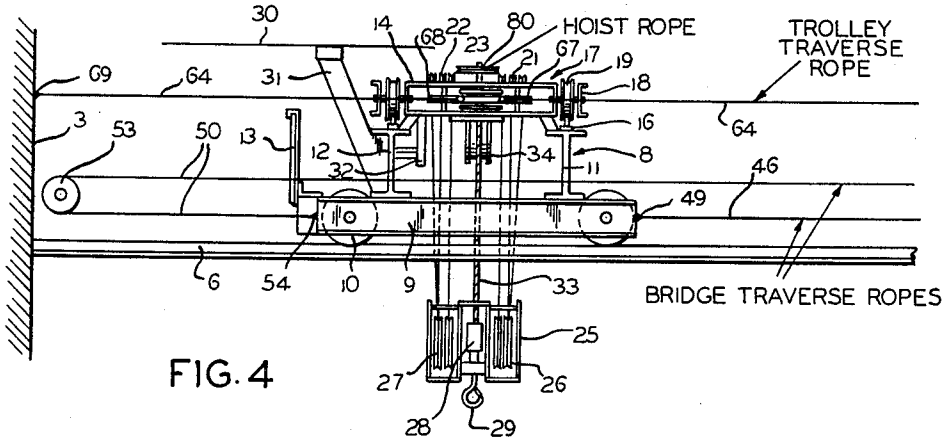


FIG. 4

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FLYING ROPE CRANE

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3 Claims. (Cl. 212—18)

This invention relates to improvements in what may generally be termed a flying rope crane, and more particularly to a crane of the overhead type embodying a travelling bridge, a trolley to traverse the bridge and a load hook on ropes depending from sheaves carried by the trolley, all moving parts of the structure being controlled from a remote point rather than from an operator's cab on the bridge or trolley, the invention being highly desirable for use in restricted locations or locations not safely accessible by an operator, although the invention may have other uses and purposes as will be apparent to one skilled in the art. It might be mentioned that where conditions are not adverse but room is scarce, the operator may sometimes ride the crane, with the traversing and hoisting machinery in a fixed location off the crane.

In the past, heavy duty cranes embodying a bridge extending transversely of and movable backwardly and forwardly over the area in which the crane is to operate with a trolley to traverse the bridge from end to end thereof most frequently had the driving and hoisting mechanism carried by the bridge or trolley, and all moving parts were controlled by an operator riding a cab on the bridge or trolley. Obviously, with the operator's cab and all such mechanism carried by the bridge or trolley, or a portion by each, head room was considerably reduced, and such a crane could not be operated in a restricted area or in an area unsafe for an operator to any satisfactory extent.

In many instances it is desirable to operate an overhead crane capable of elevating and lowering a substantially heavy load in areas not safely accessible to an operator, such, for example, as high temperature regions, radio-active areas, areas in which toxic vapors are present, and the like. It is also desirable in many cases to operate a crane of this character in compact areas where there is a definite lack of head room, areas in which the runways for the bridge must be mounted at an inclination, and other areas such as aboard a ship or submarine where there is insufficient room for all of the operating mechanism to be carried by the bridge or trolley or for an operator's cab to be disposed thereon.

With the foregoing in mind, it is an important object of the instant invention to provide an overhead bridge and trolley crane, the action of which is entirely controlled from a remote area or separate room.

Another object of this invention is the provision of an overhead crane with the bridge, trolley and hoist actuating mechanism located remotely from the crane, even in a separate room, and controlled at such remote location.

It is also a feature of this invention to provide an overhead bridge and trolley crane with the bridge and trolley traverse and the lifting hook all controlled remotely and actuated by what may be termed flying ropes located along the runway for the bridge.

It is still a further feature of this invention to provide an overhead bridge and trolley crane, neither of which carries any actuating machinery, but the actions of which such as movement of the bridge, traversing motion of the trolley, and the like are all positive by virtue of direct rope pulls, the ropes being actuated and controlled from a point remote from the crane.

Still another object of this invention is the provision of an overhead crane having a rotary load hook, the drive motor from the load hook receiving power from a trolley wire arrangement, but controlled from a point remote from the area in which the crane acts.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a schematic fragmentary plan view of a crane and drive mechanism therefor embodying features of the instant invention;

FIGURE 2 is a fragmentary elevational view of the bridge and trolley arrangement, taken substantially as indicated by the line II—II of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is a fragmentary end view of the bridge and trolley structure taken substantially as indicated by the line III—III of FIGURE 1; and

FIGURE 4 is a fragmentary end view of the bridge and trolley structure taken from the opposite end, substantially as indicated by the line IV—IV of FIGURE 1.

As shown on the drawings:

It will be apparent to one skilled in the art that the instant invention may be made in various sizes, styles, and arrangements depending upon the location in which the crane is to be used and the space available for the operating machinery and controls. By way of example therefore, and not by way of limitation, the instant invention is shown with the crane operable over an area defined by sidewalls **1** and **2**, and end wall **3**, and a substantially thick wall **4** of concrete or equivalent insulating material. The actuating machinery and control panel are disposed in a room **5**, on the opposite side of the heavy wall **4** where the equipment and the operator are both protected from high temperatures, radiations, toxic vapors, and other conditions which may be adverse to the health and well being of the operator. Any suitable arrangement may be made to permit ropes, wiring, and the like to pass through the heavy wall **4**, without danger of emissions from the opposite side of the wal.

Runways are provided in any suitable form of known construction along the side walls **1** and **2**, and at the top of these runways rails **6** and **7** respectively are disposed to function as a track for the bridge, generally indicated by numeral **8**, which moves backwardly and forwardly as desired over the area between the two runways. Since the bridge and trolley comprise fabricated framework of a generally known character, both these structures are rather diagrammatically illustrated herein.

The bridge embodies a pair of opposed trucks **9—9** each being provided with a plurality of wheels **10** to ride the aforesaid rails **6** and **7** on the runways. Mounted on the trucks **9—9** are a pair of spaced elongated side girders **11** and **12**, the girder **12** having a catwalk **13** therealong. These girders carry a transverse frame **14** at one end and a transverse frame **15** at the opposite end, the frames each having a number of pulleys journalled therein, which will be described later herein. On top of each of the girders **11** and **12** is a rail **16**, and these rails form a track for a trolley, generally indicated by numeral **17**, which traverses the bridge.

The trolley **17** comprises a pair of opposed trucks **18—18** each of which is provided with a plurality of wheels **19** to ride the rails **16—16** on the bridge. The trucks are connected by a suitable fabricated frame **20**, as best seen in FIGURE 1. On one side of the center thereof the trolley carries a set of horizontally journalled pulleys **21**, and on the opposite side thereof the trolley carries another set of similar pulleys **22**, there being the same number of pulleys in each set. These pulleys are for association with the hoist rope in a manner to be later described. Journalled in suitable brackets on one side

of the trolley frame 20 is a pulley 23, and similarly mounted on the opposite side of the frame 20 is a pulley 24, these pulleys being for association with the trolley traverse ropes, in a manner to be later described.

Suspended on the hoist rope beneath the trolley is a lower or lift block 25, and journalled in this block are two sets of pulleys 26 and 27, the set 26 being disposed beneath the set of pulleys 21 on the trolley and being one less in number than the set 21, and the set 27 is disposed beneath the pulley set 22 on the trolley, also being one less in number than the set 22. It may be mentioned at this point that the number of pulleys on the trolley sets and the number of pulleys in the load block sets are not critical but may be any number desired for a particular purpose. The load block 25 also carries a reversible hook-motor 28 connected to a depending load hook 29, the motor being for the purpose of rotating the load hook as may be needed during operation of the crane. The hook motor 28 may be energized from a set of trolley wires 30 extending above one of the runways for the bridge, and transmitted through a trolley brush 31 carried by an end of the bridge to a collector element 32 on the bridge which in turn in any suitable manner is connected to a plural-wire electric conductor 33 leading to the hook motor 28 and normally being wound upon a conductor reel 34 depending from the trolley.

It will be noted that the hook motor 28 together with its source of power just above described in the only such means carried by the crane itself, and in the event it is not desired to power drive a rotary hook, the crane need carry no drive mechanism or power connection therefor whatever.

All of the actuating machinery and rope drums are disposed in the room 5, in the illustrated embodiment, on the opposite side of the insulating wall 4 from the operating area of the crane. With reference to FIGURE 1 it will be seen that this machinery includes a hoist drum 35 actuated by means of a drive motor 38, a worm unit 39, and a spur gear casing 40 connected to the shaft of the hoist drum 35. There is also a trolley drum 41 for the trolley traverse ropes driven in a similar manner by a similar arrangement including a drive motor 42. A bridge drum 43 for the bridge traversing ropes is also driven by a similar arrangement including a drive motor 44. Also in the room 5 is a control station 45 from which the operator may control any of the motors by circuit connections of a known character, which are not illustrated, and the trolley wires 30 from which the hook motor gets its power also connect with the control station.

All movements of the crane, with the single exception of the rotation of the load hook, are caused by ropes leading from the various drums in the power and control room 5. Movements of the bridge, trolley, and hoisting means are caused by direct rope pull or by a combination of direct pull and corresponding release of separate ropes, and are thus positive motions without lag of coasting. It will be understood, of course, that each rope has several laps around the drum, but in the drawings, for purposes of clarity, the ropes are shown anchored to the drums without a series of laps that may appear confusing.

In order to move the bridge 8 backwardly and forwardly on the runway rails 6 and 7, four ropes are required. These ropes are arranged with a pair of opposed ropes connected to the bridge drum 43 at each end thereof. A rope 46 is looped around the drum 43 in one direction and anchored to the drum as indicated at 47. This rope passes over a pulley 48 at one side of the room 5, through the wall 4, and is anchored at its other end to the bridge itself as indicated at 49. An opposed rope 50 is looped around the drum 43 in the opposite direction from the rope 46, anchored to the drum as at 51, and this rope passes over a pulley 52 on by the bridge and over a pulley 53 at the opposite end of the working area adjacent the wall 3, and thence back to the opposite side of the bridge to which it is anchored as indicated at 54.

A rope 55 is wound around the drum 43 in one direction and anchored thereto as indicated at 56, adjacent the opposite end of the drum from the ropes 46 and 50. This rope 55 passes around a pulley 57 and is anchored to the bridge itself on the other end thereof from the rope 46 as indicated at 58. A second and opposed rope 59 is looped or wound around the drum 43 in the opposite direction from the rope 55 and anchored to the drum as indicated at 60. This rope passes over a pulley 61 in the control room 5, through the wall 4, on by the bridge, and over a pulley 62 adjacent the wall 3 of the working area, and thence back to the opposite side of the bridge to which it is anchored as at 63. Assuming now that the drum 43 is rotated counterclockwise, or away from the viewer, the ropes 46 and 55 will be taken up, while the ropes 50 and 59 will be released, and the bridge will be drawn to the left as seen in FIGURE 1 toward the insulating wall 4. Conversely, when the drum is rotated clockwise, or toward the viewer, the ropes 46 and 55 will be released, while the ropes 50 and 59 will be taken up acting on the opposite side of the bridge, to move the bridge toward the wall 3 of the working area. It will be noted that the pull of the ropes on the bridge are direct, and the movement is a positive one in either direction. Stopping of the drum 43, after the desired travel of the bridge, causes an immediate stopping of the bridge without any coasting.

In order to cause the trolley to traverse backwardly and forwardly on the bridge rails 16—16, two ropes are utilized, which are attached to the trolley drum 41 in opposite directions. This arrangement includes a rope 64 anchored to the trolley drum as indicated at 65, which rope passes over a pulley 66 in the control area 5, through the wall 4, over a pulley 67 on the frame portion 14 of the bridge, inwardly and around the pulley 23 on the trolley, thence around a pulley 68 also on the frame 14, and on to the wall 3 to which it is anchored as at 69. Similarly, the other rope 70 is wound around the drum 41 in the opposite direction, anchored to the drum as at 71, and this rope passes over a pulley 72 adjacent the opposite wall of the control area, over a pulley 73 on the frame portion 15 of the bridge, inwardly and around the pulley 24 on the trolley, over another pulley 74 on the frame portion 15, and then to the wall 3 to which it is anchored as at 75. Accordingly, when the trolley drum 41 is rotated clockwise, the rope 64 will be taken up while the rope 70 is released, and the trolley will be moved along the bridge rails toward the wall 1. Conversely, when the drum is rotated counterclockwise, the rope 70 will be taken up while the rope 64 is released, and the trolley will be caused to move along the bridge toward the wall 2.

For the hoisting operation, only a single rope 76 is utilized. This rope is anchored to the hoist drum 35 as indicated at 77. The rope passes around a pulley 78 adjacent the wall 2 in the control area 5, then around a pulley 79 on the frame portion 15 of the bridge, then inwardly and over the first pulley of the set 21 on the trolley, downwardly around a pulley in the set 26 of the load block 25, and alternately around the pulleys in the sets 21 and 26 and from the last pulley of the set 21 to the opposite end of the bridge around a pulley 80 on the frame portion 14 of the bridge, then inwardly and alternately around the pulleys of the set 22 in the trolley and the set 27 on the load block, and then over the last pulley of the set 22 around a pulley 82 on the bridge frame portion 15 and then to the wall 3 to which it is anchored as indicated at 83. With this arrangement, it will be noted that when the hoist drum is rotated in one direction, the load block will be elevated, and when the hoist drum is rotated in the opposite direction the load block will be lowered.

With the rope arangement as above explained, both the bridge and trolley, or either of them may be traversed, while the load on the hook remains at the same height. However, one or more of the movements may be made at the same time, if so desired.

From the foregoing, it is apparent that I have provided a novel remote control arrangement for a bridge and trolley crane which is positive in action, and which may be located at a remote point so as to enable all of the machinery to be off the crane and thus preserve head room, and in a location so as to protect the operator from any adverse effects in the surrounding atmosphere. It will also be noted that the machinery is in a location where maintenance thereof is simple at all times. No expensive additions, such as highly efficient lubrication seals, capable of providing positive retention of lubricants and which necessitate excessive care and servicing, are required on the machinery when located outside a contaminated area.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a flying rope crane installation,
means defining an area in which the crane is to operate,
a travelling bridge spanning said area,
load lifting means associated with said bridge,
drive means located outside said area to move said bridge backwardly and forwardly over said area, said drive means including a drum,
a pair of ropes connected to said drum adjacent each end thereof and lapped around said drum in opposite directions,
one of said ropes of each pair being anchored to the adjacent side of said bridge, and the other of said ropes of each pair passing over a sheave at the far side of said area and anchored to the opposite side of said bridge.

2. In a flying rope crane installation,
means defining an area in which the crane is to operate,
a travelling bridge spanning said area,
drive means located outside said area to move said bridge backwardly and forwardly over said area,
a trolley to traverse said bridge,
load lifting means associated with said trolley,
a pair of spaced sheaves at each end of said bridge,
a sheave on each side of said trolley,
a rope anchored at one end at the far side of said area, trained over the pair of sheaves at one end of the bridge and also over the sheave on the adjacent side of said trolley,

a separate rope similarly anchored on the other side of the area and similarly trained over the sheaves at the other end of the bridge and on the other side of said trolley, and
a single drive drum outside said area to which both said ropes are connected and lapped therearound in opposite directions.

3. In a flying rope crane installation,
means defining an area in which the crane is to operate,
a travelling bridge spanning said area,
a trolley to traverse said bridge,
sheaves at each end of said bridge and each side of said trolley,
a pair of separate ropes each having an end anchored at the far side of said area and trained over said sheaves one on one side of said trolley and one on the other side,
a single drive drum outside said area to which both said ropes are connected and lapped therearound in opposite directions,
a pair of bridge ropes associated with each end of said bridge,
one of the ropes of each pair of bridge ropes being anchored to the adjacent side of said bridge and the other rope of each pair passing over a sheave at the far side of said area and anchored to the opposite side of said bridge, and
another single drive drum outside said area to which one pair of bridge ropes is connected at each end thereof and lapped therearound in opposite directions.

References Cited in the file of this patent

UNITED STATES PATENTS

3,065,864	Coffman	Nov. 27, 1962
2,524,189	Clay	Oct. 3, 1950
2,743,024	Schmitt et al.	Apr. 24, 1956
2,822,929	Kruzic	Feb. 11, 1958
2,954,880	Howarth et al.	Oct. 4, 1960
3,065,864	Coffman	Nov. 27, 1962

FOREIGN PATENTS

3,817	Great Britain	Mar. 11, 1890
19,204	Great Britain	Nov. 29, 1889