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MOLD FOR BUILDING CONCRETE SEWERS AND TUNNELS.

APPLICATION FILED JUNE 7, 1909.

1,003,847. **Patented Sept. 19, 1911.**

2 SHEETS—SHEET 1.

Fig. II.

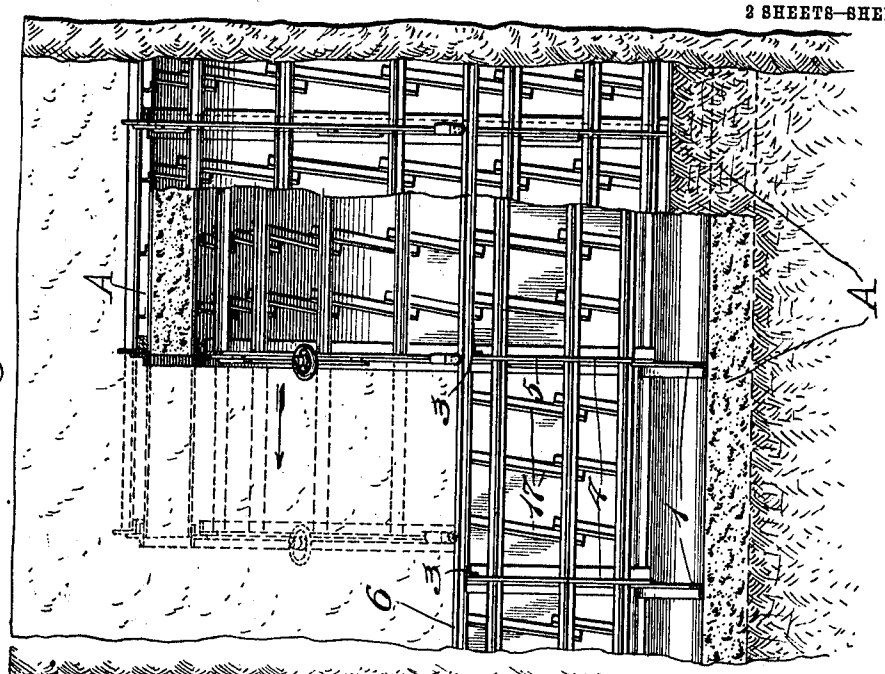

Fig. I.

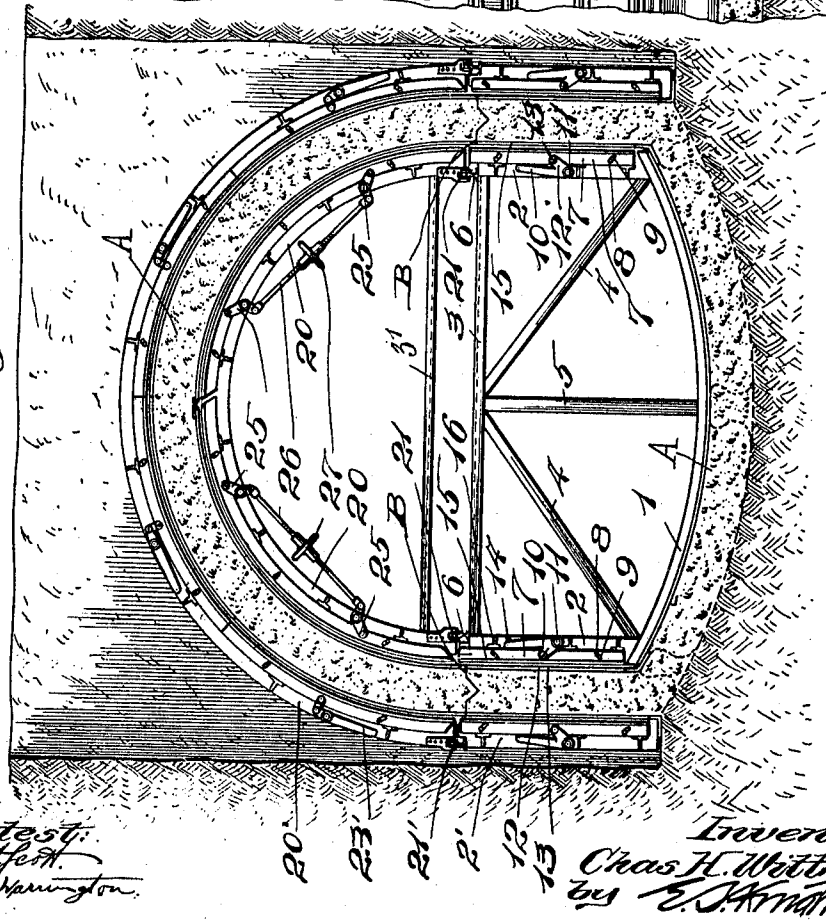

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Fig. III.

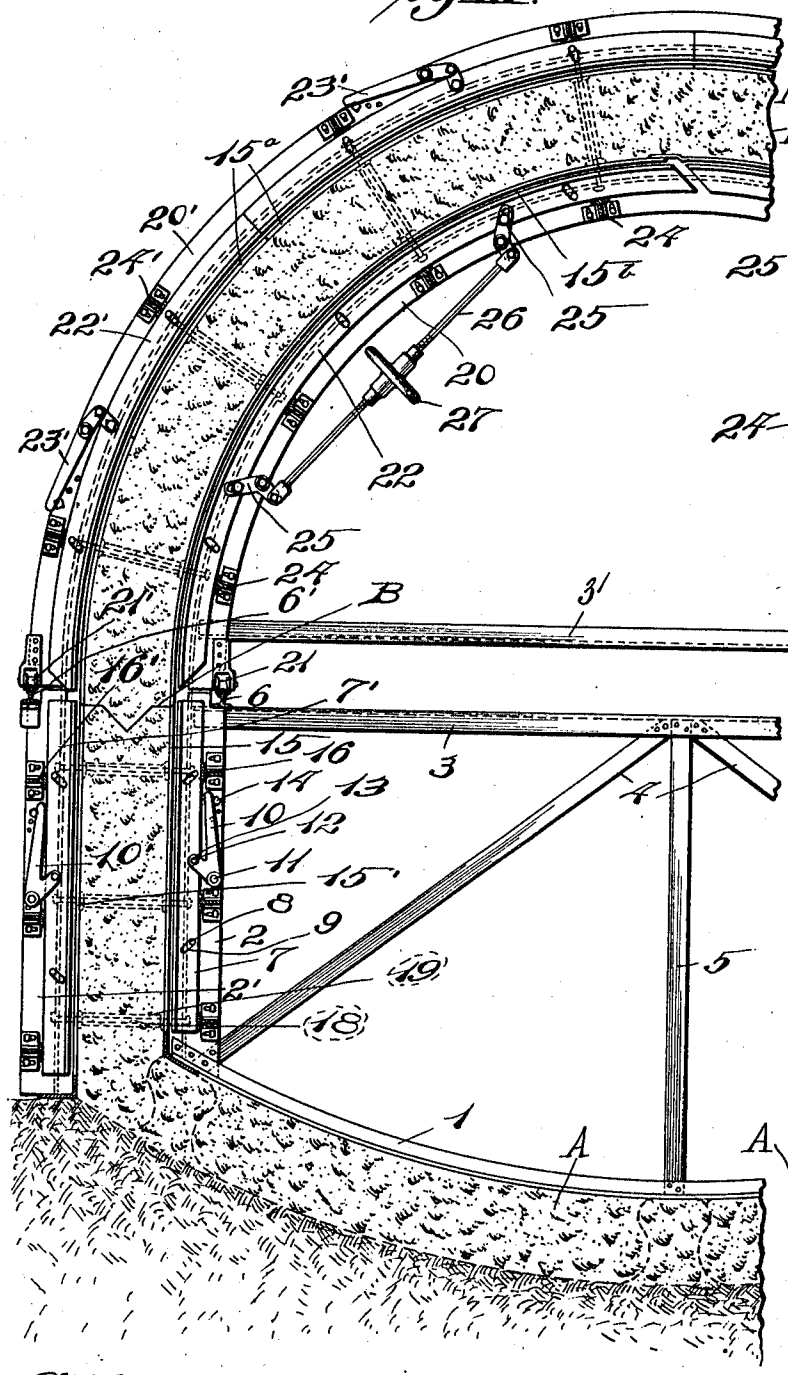
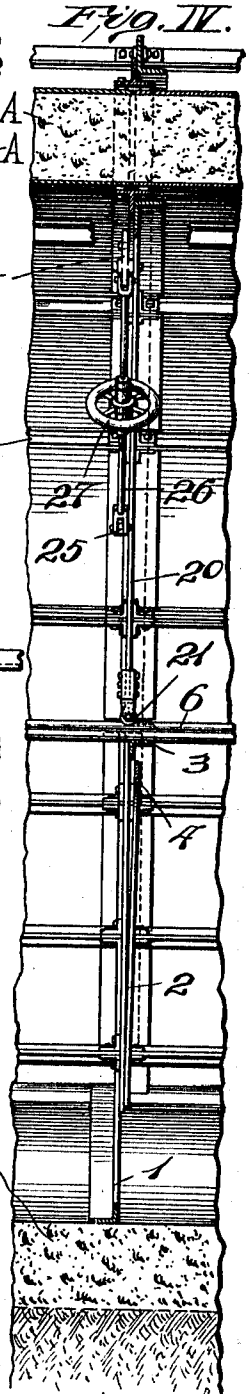


Fig. IV.



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CHARLES H. WITTHOEFFT, OF ST. LOUIS, MISSOURI.

MOLD FOR BUILDING CONCRETE SEWERS AND TUNNELS.

1,003,847. Specification of Letters Patent. **Patented Sept. 19, 1911.**

Application filed June 7, 1909. Serial No. 500,549.

To all whom it may concern:

Be it known that I, CHARLES H. WITTHOEFFT, a citizen of the United States of America, residing in the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Molds for Building Concrete Sewers and Tunnels, of which the following is a clear, full, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to horizontally divided or sectional molds for use in building concrete sewers or tunnels, and it has for its object the construction of a mold of this description in which the upright portions of the mold and the arch portions have to permit of the mold facing members being firmly held in place during molding operations and readily relieved from their positions of service after the molded concrete has become set, in order that the sections of the mold may be shifted to new positions.

A further object of the invention is to provide in a mold of the character named a construction that permits of the arch sections of the mold traveling on rollers upon the upright sections of the mold when said arch sections are to be shifted to new positions, thereby greatly facilitating the rapidity with which the mold sections may be advanced from one position to another during sewer or tunnel molding operations.

Figure I is an end elevation of a sewer or tunnel and my mold as it appears in service. Fig. II is a vertical longitudinal section through the mold and tunnel with a portion of the mold shown in side elevation. Fig. III is an enlarged vertical cross section through a portion of a tunnel and my mold. Fig. IV is an enlarged vertical longitudinal section through the tunnel and mold.

In the accompanying drawings: A designates a concrete sewer or tunnel in course of construction and which may, in the use of my mold, be of any desired configuration.

In constructing a sewer or other tunnel by the use of my mold, I first lay a bottom bed of concrete, and it is upon this bed that the inner members of my mold are supported.

1 designates curved transverse sills that are laid at intervals upon the concrete bed the side walls of which are to be surmounted by the arch of the tunnel in the use of my mold.

2 designates interior side stanchions of my mold secured at their lower ends to the ends of the transverse sills 1 and which are united at their upper ends by horizontal braces 3 to which are connected diagonal braces 4, and central vertical braces 5 that extend from the transverse sills to the horizontal braces.

The members just described constitute the main framework of the lower part of my mold as used at the inside of the space within which the arch of metal is to be produced. This framework serves to support trackrails 6 having utility to be hereinafter mentioned and also to support adjustable members that I will next describe.

7 designates backing bars that are adjustably and slidingly connected to the stanchions 2 and are adapted to be shifted horizontally relative to the stanchions, the form of connection between these members to permit shifting of the backing bars being preferably pins 8 mounted in the stanchions and extending from the sides of the stanchions, and obliquely disposed slots 9 in the backing bars and in which said pins are loosely fitted. To provide for the shifting of the backing bars in an outward direction and their retraction, I utilize levers 10 that are pivoted at 11 to the stanchions and are provided with arms 12 pivotally connected at 13 to the backing bars. These levers may be readily operated by hand to move the backing bars inwardly and outwardly, and when the backing bars are in their outwardly adjusted positions, the levers may be held from movement by any suitable means such as pins 14 interposed into the stanchions to which the levers are fitted. The backing bars serve to hold mold plates 15 from movement in an inward direction, or in other words, from movement in a direction toward the stanchions 2.

16 are T-shaped longitudinal brace bars located between the stanchions 2 and which are adjustably connected at their ends to said stanchions by pin and slot connections. These brace bars are adapted to bear against the backing bars 7 after said backing bars have been adjusted outwardly.

To hold the mold plates in proper posi-

tions and to prevent inward movement of the mold plates intermediate of the backing bars, I utilize resistance members 17 (see Fig. II) that are interposed between the mold plates and the brace bars.

2′ designates exterior side stanchions similar to the stanchions 2, and which are located opposite to the side stanchions 2, but sufficiently separated therefrom to permit of the production of the side walls of the tunnel arch between said stanchions. The exterior stanchions serve as supports for backing bars 7′ that are adjustably connected to the stanchions 2′ in a manner similar to the connection of the backing bars 7 to the stanchions 2, and are adapted to be shifted by levers 10′ similar to the levers 10.

16′ are adjustable brace bars fitted to the stanchions 2′ and having play by pin and slot connections similar to the brace bars 16.

15′ are outer mold plates that are held in upright positions by the backing bars 7′ and other members associated therewith in a manner similar to that in which the inner mold plates 15 are held.

The interior and exterior stanchions 2 and 2′ respectively are connected at intervals by tie-rods 18 (see dotted lines, Fig. III). These tie-rods are equipped at their ends with nuts that are adapted to bear against the faces of the stanchions. The tie-rods are surrounded intermediate of the mold plates 15 and 15′ within the space in which the arch walls of the tunnel are to be molded by tubular concrete distance pieces 19 that serve to hold the mold plates separated to an extent corresponding to the thickness of the wall to be produced.

When the mold plates 15—15′, the stanchions 2—2′ and the adjustable parts supported by these stanchions have been put in place ready for the set of the mold, at which time the brace bars 16—16′ are in retracted positions, the backing bars 7—7′ are adjusted to the mold plates through the medium of the levers 10—10′ and said levers are preferably secured from movement. The brace bars 16—16′ are then adjusted to the resistance bars and secured in their adjusted positions, thereby preventing movement of the backing bars in directions away from the mold plates under pressure exerted thereagainst by the concrete when it is molded into the spaces between the mold plates. The resistance members 17 are also introduced between the brace bars and the mold plates at the time of adjustment of the brace bars. The modeling of the mold plates having been carried out and their adjustment having been provided, as just previously explained, the lower portions of my mold are in condition for the molding of the lower sections of the side walls of the arch of a tunnel, which are molded up to points indicated at B, Figs. I and III.

6′ designates trackrails supported by the stanchions 2′ and are companionable with the trackrails 6 supported by the stanchions 2.

I will next proceed to a description of the upper arch construction of my mold.

20 and 20′ designate, respectively, inner and outer arched shape carriers that extend in arcs with the side stanchions 2 and 2′, having horizontal braces 3′ at their lower ends and these carriers being equipped at their lower ends with travelers or track wheels 21 and 21′ operable upon the trackrails 6 and 6′. The object in providing the carriers with travelers is to permit of said carriers being supported by the lower portions of the mold in a manner to provide for the upper arch producing elements of the mold being transported from one location to a new location as the tunnel molding operation continues after the lower portions of the side walls of the tunnel have been produced and without the necessity of dismounting the upper mold producing elements from elevated positions.

22 and 22′ designate curved backing bar sections complementary to the backing bars 7 and 7′, respectively, and which are connected to the arched carriers 20 and 20′ in a manner similar to the connection of the backing bars 7 and 7′ to the stanchions 2 and 2′. The outer backing bar sections are adapted to be moved to and from curved mold plates 15^a, extending in an arc from the mold plates 15′, through the medium of levers 23′ similar to levers 10 and 10′. After the backing bar sections have been adjusted, they are held by adjustable brace bars 24′ similar to the brace bars 16 and 16′. The backing bar sections 22 are adjustable relative to the carriers 20 to hold the inner curved mold plates 15^b in proper positions, and said backing bar sections are preferably manipulated by levers 25 pivoted to the carrier 20 and having slot and pin connection with the backing bar sections, as seen in Fig. III.

26 are operating rods connected at their outer ends to the levers 25, to the inner ends of which is fitted a turnbuckle 27 by which the rods may be actuated for the purpose of moving the levers 25 to impart desired outward and inward movements to the backing bar sections 22.

24 are adjustable brace bars fitted to the carrier 20 and adapted to hold the backing bar sections in positions to maintain the inner mold plates 15^b in proper position relative to the outer mold plates 15^a.

The carriers 20 and 20′ are connected by tie rods 18, similar to those connecting the

stanchions 2 and 2′, and which are surrounded by tubular distance pieces 19.

In the practical use of my mold, the lower elements of the mold comprising the stanchions 2—2′ at each side of a space in which a tunnel or sewer of concrete is to be built, and the parts associated with these stanchions, including the bracing members, are put in place, with the pairs of stanchions connected by the tie rods 18, the distance pieces 19 upon said tie rods, and the mold plates 15—15′ positioned between the stanchions and the ends of said distance pieces. Then, before the molding operation, the backing bars 7—7′ are adjusted to the mold plates, and the brace bars 16—16′ are adjusted to the backing bars to hold them from movement. The mold for the lower portions of the side walls of the arch of a tunnel is now in condition for use and concrete may be introduced into the space between the mold plates that is to receive it. After the lower portions of the side walls of the tunnel arch have been molded to a desired length, the upper portion of the mold comprising the arched carriers 20—20′ and the elements associated with these parts are mounted upon the lower mold members so that the travelers 21—21′ will rest upon the trackrails 6—6′ and be in positions to ride thereon. These last named elements, as previously stated, are connected in a manner similar to the stanchions 2—2′ and parts associated with them, and therefore, when the movable parts of the upper portion of the mold are manipulated to degrees corresponding to the degrees of manipulation of the movable parts of the lower mold sections, the upper portion of the mold is in condition to receive concrete which is introduced between the inner and outer mold plates 15^b and 15^a to fill the space between them. It should be here stated that the outer mold plates 15^a at the top of the arch are put in place after the space within the mold beneath the top of the arch has been filled with concrete, thereby affording opportunity for the introduction of the concrete. After the upper portion of the tunnel has been molded, and the concrete has become set, the mold plates 15^a and 15^b are released by moving the brace bars 24′ and 24 and the backing bar sections 22′ and 22 away from the mold plates. The nuts upon the tie rods 18 that extend through the upper portion of the tunnel arch to the carriers 20—20′ are removed, thereby permitting the withdrawal of these tie rods so that the carriers are disconnected from the arch of the tunnel. The carriers and the parts associated with them, being then free, may be readily moved forwardly on the trackrails 6—6′ to be again connected by the tie bolts ready for the next molding operation above the stretch of molded concrete wall lying between the lower mold plates 15—15′ and which is ready to be surmounted by the upper portions of the concrete tunnel arch.

I claim:

1. In a mold for making concrete tunnels, the combination with mold plates, of lower stationary vertical mold plate bracing sections, track rails supported by said lower stationary mold plate bracing sections, and an arched mold section comprising an inverted U-shape carrier provided with travelers at its ends, said travelers being ridable upon said track rails, backing bar sections adjustably fitted to said carrier and movable toward and away from the adjacent mold plates employed in forming the arch of the tunnel, bracing bars adjustably fitted to said carrier by which said backing bars are held in fixed positions during a molding operation, levers pivoted to said carrier and having connection with said backing bars, operating rods connected to said levers, and turnbuckles connecting said operating rods whereby the levers may be operated to impart movement to the backing bars transversely of the carrier.

2. A lower mold section comprising transverse sills, side stanchions secured at their lower ends to the ends of the transverse sills, horizontal braces secured to the upper ends of the side stanchions, central vertical braces and diagonal braces secured at their lower ends to the transverse sills and at their upper ends to the horizontal braces, longitudinal brace bars connecting the side stanchions, backing bars adjustably connected with the side stanchions, means for adjusting the backing bars on the side stanchions, and mold plates held in position by the backing bars.

3. A lower mold section comprising transverse sills, side stanchions secured at their lower ends to the ends of the transverse sills, horizontal braces secured to the upper ends of the side stanchions, central vertical braces and diagonal braces secured at their lower ends to the transverse sills and at their upper ends to the horizontal braces, longitudinal brace bars connecting the side stanchions, backing bars adjustably connected with the side stanchions, means for adjusting the backing bars on the side stanchions, mold plates held in position by the backing bars, and resistance members located between the longitudinal brace bars and the mold plates.

4. A lower mold section comprising transverse sills, side stanchions secured at their lower ends to the ends of the transverse sills, horizontal braces secured to the upper ends of the side stanchions, central vertical

braces and diagonal braces, secured at their lower ends to the transverse sills and at their upper ends to the horizontal braces, longitudinal brace bars connecting the side stanchions, backing bars adjustably connected with the side stanchions, means for adjusting the backing bars on the side stanchions, mold plates held in position by the backing bars, and track rails mounted on the side stanchions.

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In the presence of—
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