G. F. DILLIG.

MOLD APPARATUS.

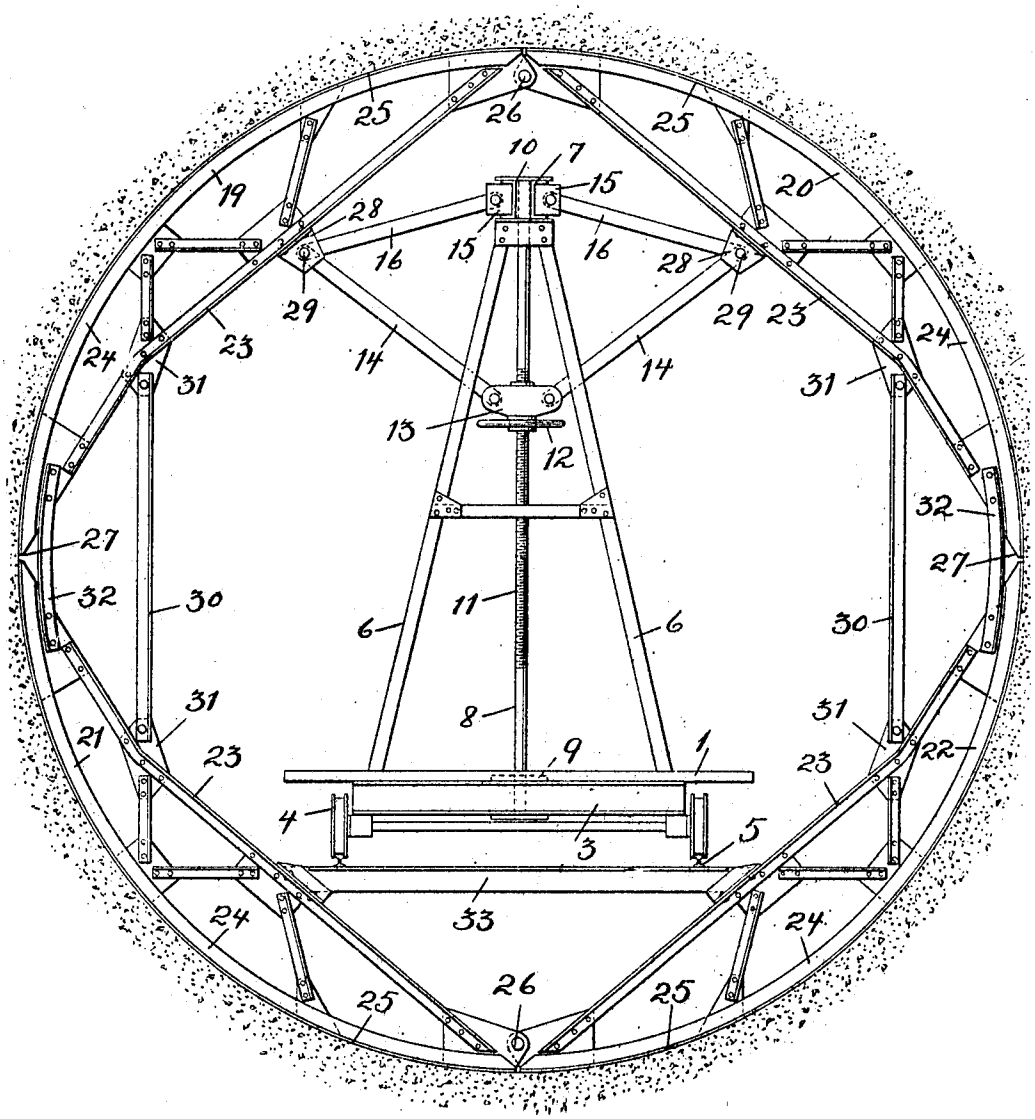
APPLICATION FILED AUG. 15, 1910.

1,035,425.

Patented Aug. 13, 1912.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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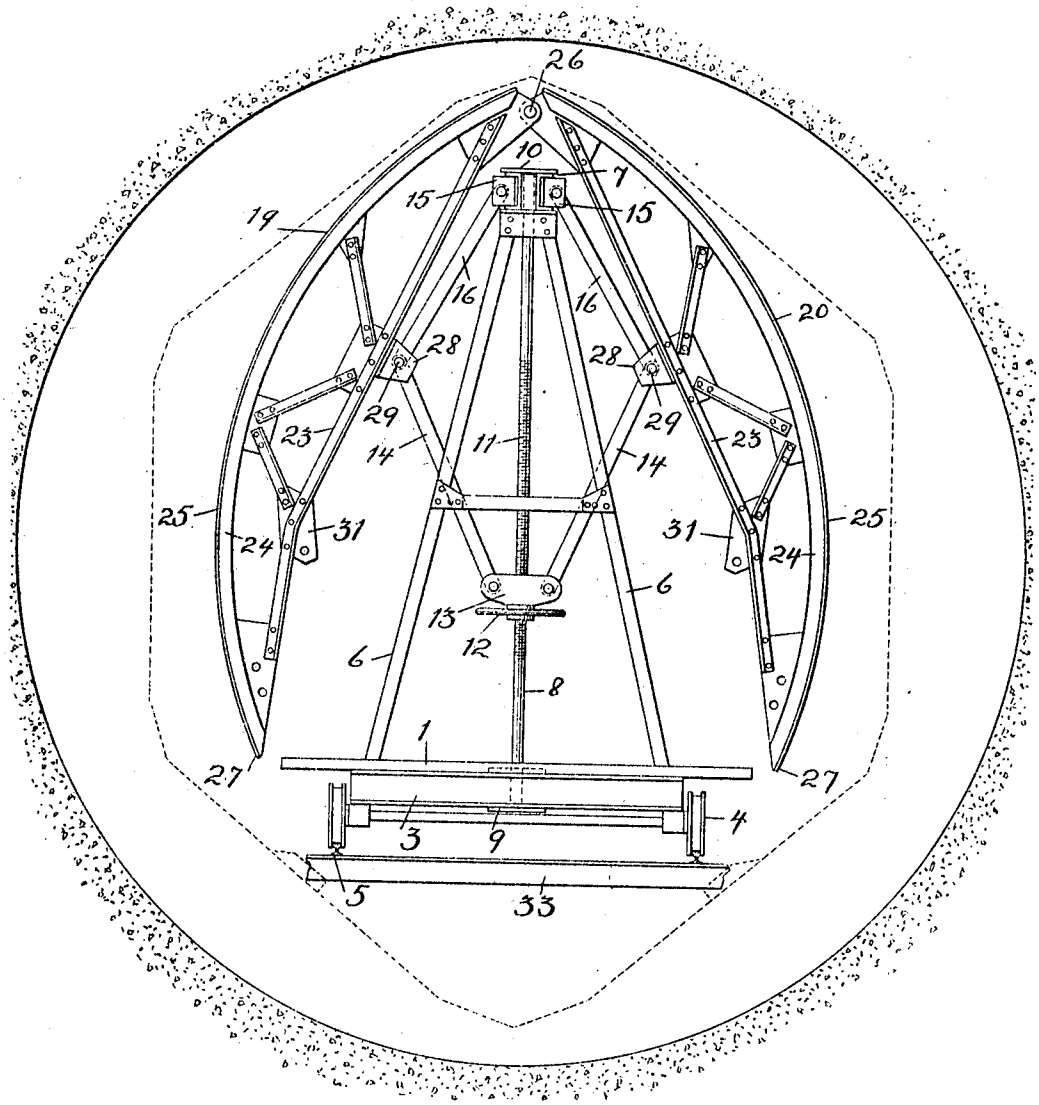
5 SHEETS—SHEET 2.

Fig. 2.



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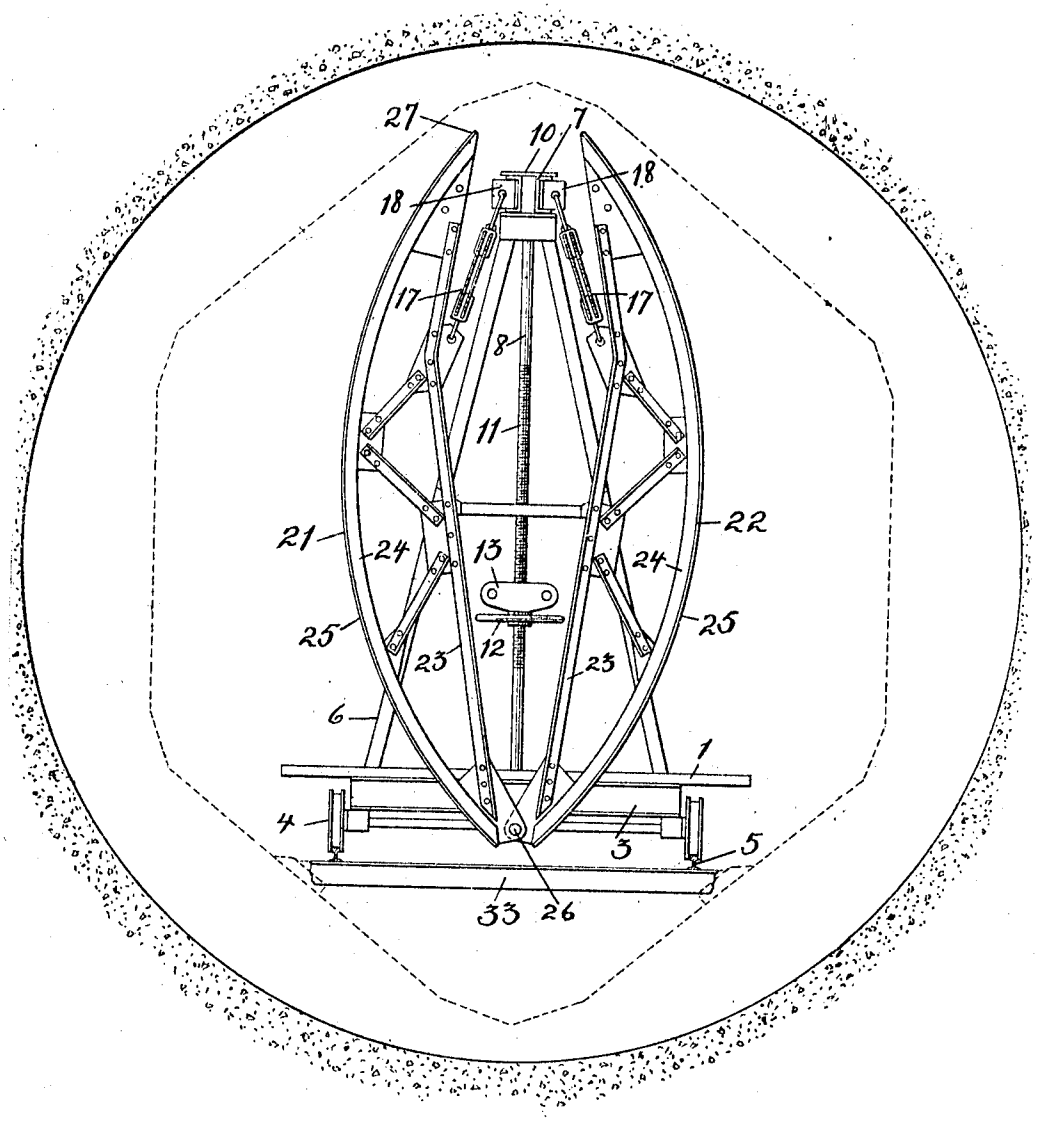
5SHEETS—SHEET 3.

Fig. 5.



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5 SHEETS—SHEET 4.

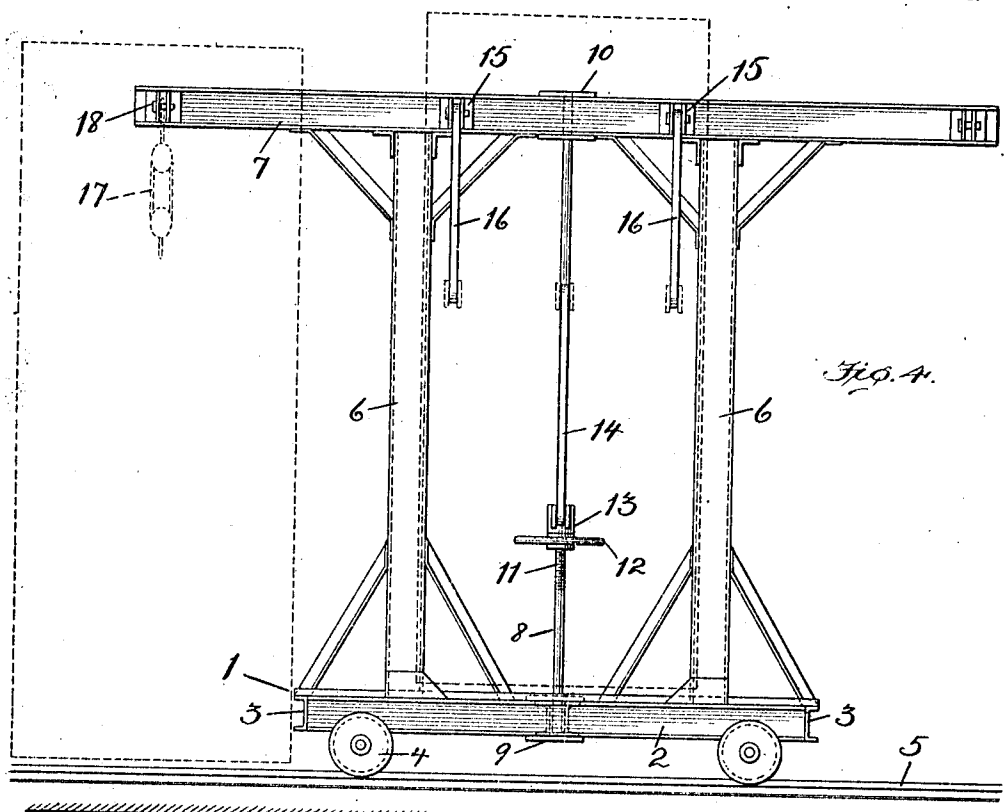

Fig. 4.

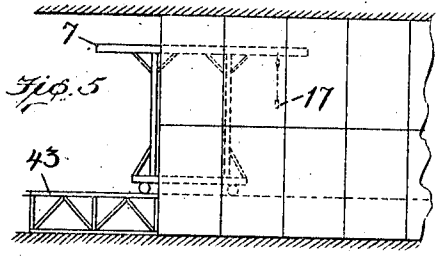

Fig. 5.

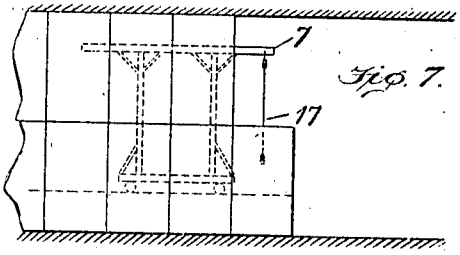

Fig. 7.

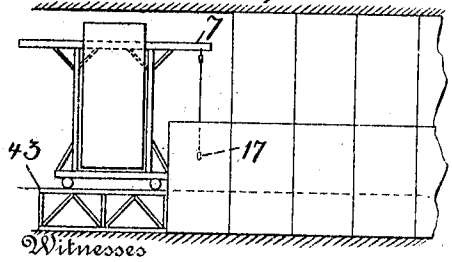

Fig. 6.

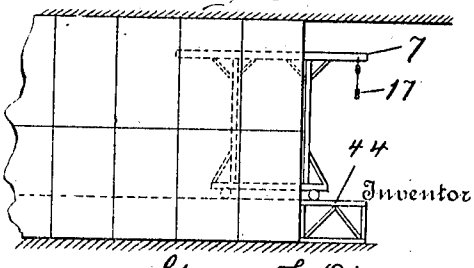

Fig. 8.

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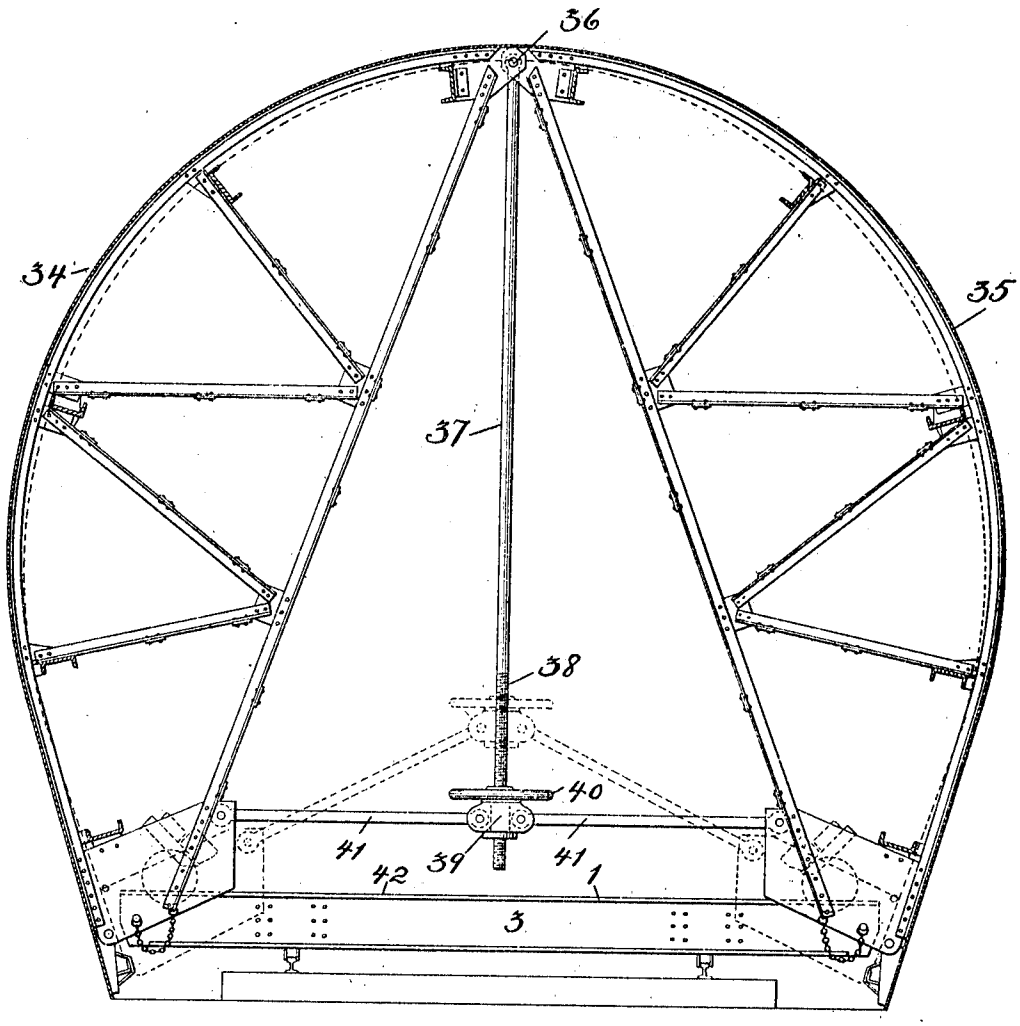
5 SHEETS—SHEET 5.

Fig. 9.



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UNITED STATES PATENT OFFICE.

GEORGE F. DILLIG, OF BALTIMORE, MARYLAND.

MOLD APPARATUS.

1,035,425. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed August 15, 1910. Serial No. 577,168.

To all whom it may concern:

Be it known that I, GEORGE F. DILLIG, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Mold Apparatus, of which the following is a specification.

This invention relates to an improved mold apparatus for use during the formation or building of tunnels, sewers or similar structures in a continuous hollow form of concrete, cement, brick or other material.

One object of the invention is to provide an improved construction of mold sections which may readily be expanded, contracted and transferred as the building of the structure progresses.

Another object is to provide an improved construction of mold section and carrier whereby one section may readily be collapsed and moved forward through other expanded sections so that the respective sections may be used repeatedly.

A further object is to provide an improved construction of mold conveyer and expander whereby to convey collapsed mold-sections through expanded mold-sections and to locate and expand said sections.

With these and all other objects and advantages growing out of the disclosures, the invention is illustrated in the accompanying drawings, in which,

Figure 1, is a cross-sectional view through a tunnel structure and shows the improved mold apparatus therein. Fig. 2, is a similar view through a tunnel structure and shows the improved upper mold members or sections sustained by the conveyer or carriage in a collapsed condition. Fig. 3, is a similar view through a tunnel structure and shows the improved lower mold members or sections sustained in a collapsed condition by the conveyer or carriage. Fig. 4 is a side elevation of the carriage and the devices thereon for expanding or collapsing the mold sections and also shows by broken lines, the manner of sustaining and carrying the contracted upper and lower sections. Figs. 5, 6, 7 and 8 are diagrammatic side views of a portion of a tunnel or sewer showing the several mold sections in place and the manipulation or several positions of the carriage in taking down and setting up the sections, and Fig. 9 is a cross-sectional view through a mold structure having a slightly modified form of expanding and contracting devices but embodying the features of my invention.

Referring to the drawings, 1, designates a carrier of any preferred construction but in the present instance it consists of a frame of side bars, 2; and cross-bars, 3, which are mounted on wheels, 4, that travel on track rails, 5, which latter are sustained preferably in a manner hereinafter to be described. Suitable bars, 6, are sustained on the frame and extend upwardly therefrom and in the present instance these bars are arranged in pairs,—two at each end of the carrier, and incline more or less toward each other so that their upper ends may sustain horizontal beams, 7, in a central position over the frame as clearly seen in Fig. 4. The bars, 6, may be braced in any desirable manner with respect to each other and also with respect to the carrier frame so as to make them sufficiently rigid and strong to serve the purpose of supports, as shown in Fig. 4.

A rod, 8, has a vertical position with respect to the carrier, 1, and in the forms shown in Figs. 1 to 4 inclusive is sustained at its lower end in a bearing, 9, on the carrier and its upper end enters suitable sockets or plates, 10, that are attached to the horizontal beams, 7. This rod, 8, is provided with screw threads, 11, so that a suitable hand wheel, 12, or equivalent device may be made to travel vertically thereon by engaging said threads. A head, 13, loosely engages the rod, 8, and rests upon the upper side of the hand wheel or other device, 12, that travels on the rod and said head pivotally sustains the inner ends of spreader bars, 14, which extend outwardly from said head and which end may be raised or lowered with the head as the hand wheel or other device is moved vertically on the rod.

The horizontal beams, 7, over the carriage are provided with a plurality of brackets, 15, which are secured thereto intermediate its ends, as clearly seen in Fig. 4, and said brackets pivotally sustain the inner ends of arms, 16, the outer ends of which latter are to engage and sustain mold sections as will presently more fully appear. A block and fall, 17, is preferably carried by brackets, 18, at the opposite ends of the horizontal beams, 7, also for a purpose presently to be described.

The mold sections may vary in number

according to the character of the work under construction, but in forming a complete circular tunnel or sewer as illustrated in Figs. 1, 2 and 3, I prefer to employ four sections denoted by the numerals, 19, 20, 21 and, 22, respectively. The sections comprise a structural frame work, 23, having a curved outer chord, 24, which carries lagging plates, 25, that completely cover the frame. In a horizontally longitudinal direction the plates that cover the frame may vary in breadth and width but they are usually as broad as they can be made without interfering with their ready handling. The sections are arranged in pairs,—the sections, 19, and, 20, comprising one pair and the sections, 21, and, 22, comprising the other pair. In the formation of a complete circular tunnel or sewer both pairs of mold sections will be employed as shown in Fig. 1, wherein it will be noted that the sections, 19, and, 20, have position at the upper side of the arch and the sections, 21, and, 22, at the lower side thereof. The sections of each pair are pivotally connected at, 26, so that they may swing with respect to each other from a central vertical line through the tunnel. By this connection the free ends, 27, of the sections may be swung inwardly toward the vertical rod to collapse or contact the sections or moved outwardly from said rod to expand the same. In order to effect a ready expansion or contraction the frame-work of each section is provided with a suitable angle plate, 28, with which the outer ends of the spreader bars are pivotally connected at, 29. In Fig. 1 the outer ends of the spreader bars, 14, and the outer ends of the arms, 16, are both pivotally connected with the mold sections so that the vertical movement of the head, 13, on the rod, 11, will cause the spreader arms to move outwardly or inwardly as the case may be to swing the two sections on their pivot, 26, to expand or contract said sections.

It will be noted, by reference to Fig. 2 that when collapsing the mold sections from the position shown in Fig. 1 to that shown in Fig. 2 the adjacent pivotally-connected ends of the section will drop away or move downwardly from the highest point of the arch a sufficient distance to enable them to clear and be passed or moved through other expanded sections.

In practice, after a lower mold section or pair of sections has been properly placed or positioned, the upper pair of sections will be moved into position and expanded. While held in the expanded condition, suitable connecting bars, 30, are bolted to plates, 31, which are provided on the respective frames for that purpose. The spreader bars, 14, and pivoted arms, 16, may then be disconnected from the mold sections and the carrier moved to the rear of the tunnel or sewer to be engaged with other mold sections and carry the latter forward to be set up. Splice bars, 32, are provided adjacent the circumference of the mold sections to secure the ends of the upper and lower sections together, as seen in Fig. 1.

The rails, 5, on which the carrier travels are sustained on removable cross-beams, 33, which rest upon the lower mold sections, 21, and, 22, which beams are removed before the said sections are collapsed.

In the form shown in Fig. 9, the mold sections, 34, and, 35, are pivotally connected at, 36, and a rod, 37, is sustained at one end at the joinder of the two sections and extends between the two sections and at right angles to the pivot. This rod has the screw-threaded exterior, 38, and carries a head, 39 and hand wheel, 40. The spreader bars, 41, each have one end pivotally connected with the head on the rod and their other ends pivotally engage the frames of the mold sections. It is therefore obvious that the movement of the head on the rod will cause the spreader bars to expand or collapse the sections. In this instance the mold sections are sustained on a carriage, 42, that is movable on rails laid for that purpose.

The operation of collapsing, transferring and again setting up the forms or sections is diagrammatically illustrated in Figs. 5 to 8 inclusive. By reference to Fig. 5, it will be noted that the carriage is sustained on a light rail-supporting structure, 43, so that the carriage will be in position in the upper and lower mold sections that are to be collapsed and moved forward. While in this position the spreader bars, 14, will be connected to the sections, 19, and, 20, and the arms, 16, from the beams, 7, also connected to said sections. The connecting bars, 30, and splice bars, 32, will then be disconnected to free the two pairs of sections whereupon the hand-wheel, 12, may be operated to allow the free ends of the sections to swing toward each other or collapse as seen in Fig. 2. The carriage will then be moved to one side with the collapsed section sustained thereby as seen in Fig. 6, so that the forward end of the beam, 7, may have a position substantially centrally over the lower sections, 21, and, 22, so that the block and fall, 17, may be engaged with the plates, 31. The tracks, 5, and supporting beam, 33, are then removed from the lower section whereupon said sections may be raised by the block and fall and at the same time collapsed as shown in Fig. 3. A short rail is then temporarily placed between the structure, 43, and the rails in the expanded form ahead so that the carriage supporting the two collapsed sections may be rolled forwardly through the expanded forms to the opposite end where the forms are to be set

up again as seen in Fig. 7. When the collapsed forms have been carried through the expanded forms or sections the lower form sections will be lowered into position, as in Fig. 7; the tracks will then be placed in said lowered sections and a rail-supporting structure, 44, will be laid in front of the positioned lower sections. The carriage will then be moved forward and partly sustained by the structure, 44, while the upper sections are expanded and brought into register with the lower sections, after which the connecting bars, 30, and curved plates, 32, will be attached to the upper and lower sections to rigidly secure them in place. The spreader bars, 14, and arms, 16, may then be disconnected from the sections and the carriage returned to repeat the operation on the succeeding sections as soon as the concrete has set sufficiently to permit their removal.

By means of this invention the mold sections may be readily set up, expanded and secured together and as readily collapsed displaced and moved forward and the construction work at one end of the tunnel or sewer thus be carried on without interruption.

Having thus described my invention what I claim and desire to secure by Letters Patent is,—

1. In a portable and expansible mold apparatus the combination with a movable carriage of a plurality of structural metal frames pivotally connected at their upper ends and above the carriage and each frame carrying curved plates; a screw-threaded rod extending vertically between the carriage and the pivot joint at the upper ends of the structural metal frames and said rod extending centrally between the lower free ends of the opposed structural frames; a head on the exterior of the said threaded rod; a rotatable head engaging the threads of the rod and having position at one side of the head whereby to move the head longitudinally on the rod; an arm at one side of the head and having its inner end pivotally connected to the head and its outer end pivotally engaging the structural frame at one side of the rod; another arm at the diametrically-opposite side of the said head and having its inner end pivotally connected to the head and its outer end pivotally engaging the structural frame at the other side of the rod whereby the movement of the rotatable head on the threaded rod will cause the inner pivoted ends of the arms to move vertically at opposite sides of the rod and simultaneously swing the free ends of the opposed structural frames equal distances with respect to the said threaded rod.

2. In a portable mold apparatus the combination with a movable carriage of a frame sustained by and extending above the carriage; a rigid rod extending vertically from the carriage and having its upper end held by the frame; a head on the rod; means for moving the head longitudinally on said rod; mold sections extending over the frame, rod and carriage and having their ends pivotally connected above the upper end of the rod; an arm at one side of the rod and having one end pivotally engaging the head on the rod and its other end pivotally engaging one of the pivotally-connected mold-sections; another arm at the opposite side of the rod and having one of its ends also engaging the said head and its other end pivotally connected with another of the said pivotally-connected mold-sections, and means traveling on the rod at one side of the head for moving the latter longitudinally on said rod to simultaneously swing the free ends of the pivotally-connected mold sections toward or from the rod.

3. In a portable mold the combination with a carriage, of a rod extending from the carriage and having screw threads; a beam sustained from the carriage and extending both to the front and at the rear of the said rod; spreader arms radiating from about the rod; arms extending laterally from the beams and mold sections carried by the arms and spreader bars.

4. In a portable mold apparatus the combination with two pivoted lower mold sections and two pivotally-connected upper mold-sections and each mold section having a structural frame work; of means for connecting the adjacent ends of the upper and lower mold-sections whereby to form a complete circular mold; trackers and supporting means carried by the two lower mold sections; a carriage movable on said tracks; means carried by the carriage for engaging, collapsing and carrying the lower mold sections, and means carried by the carriage for collapsing and conveying the upper mold sections to move said lower and upper mold-sections while collapsed through other expanded mold sections.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE F. DILLIG.

Witnesses:
CHAS. B. MANN,
G. FERDINAND VOGT.