

M. NOELLE.
FURNACE CHARGING APPARATUS.
APPLICATION FILED AUG. 20, 1910.

990,379.

Patented Apr. 25, 1911.

2 SHEETS—SHEET 1.

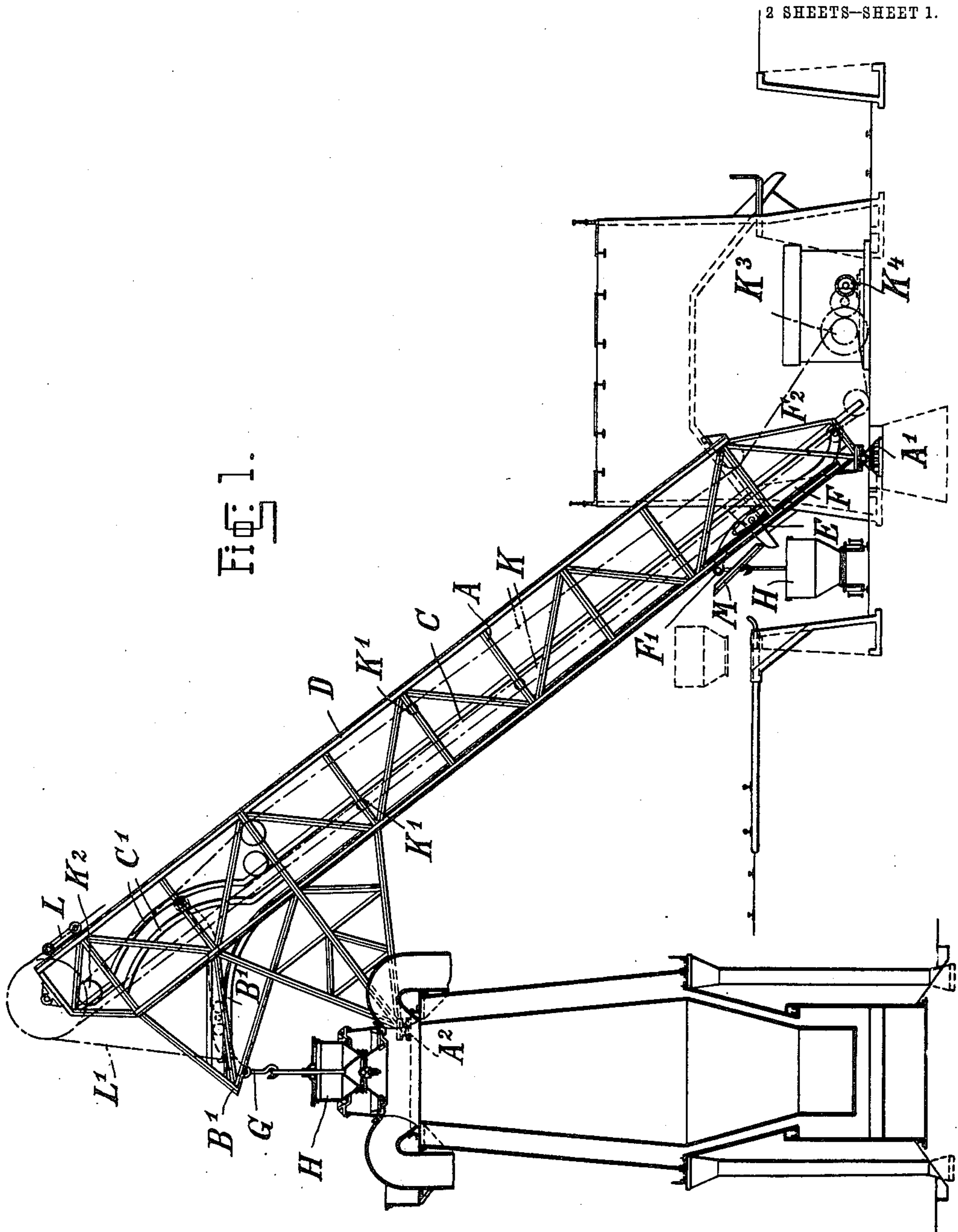


FIG. 1.

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WITNESSES

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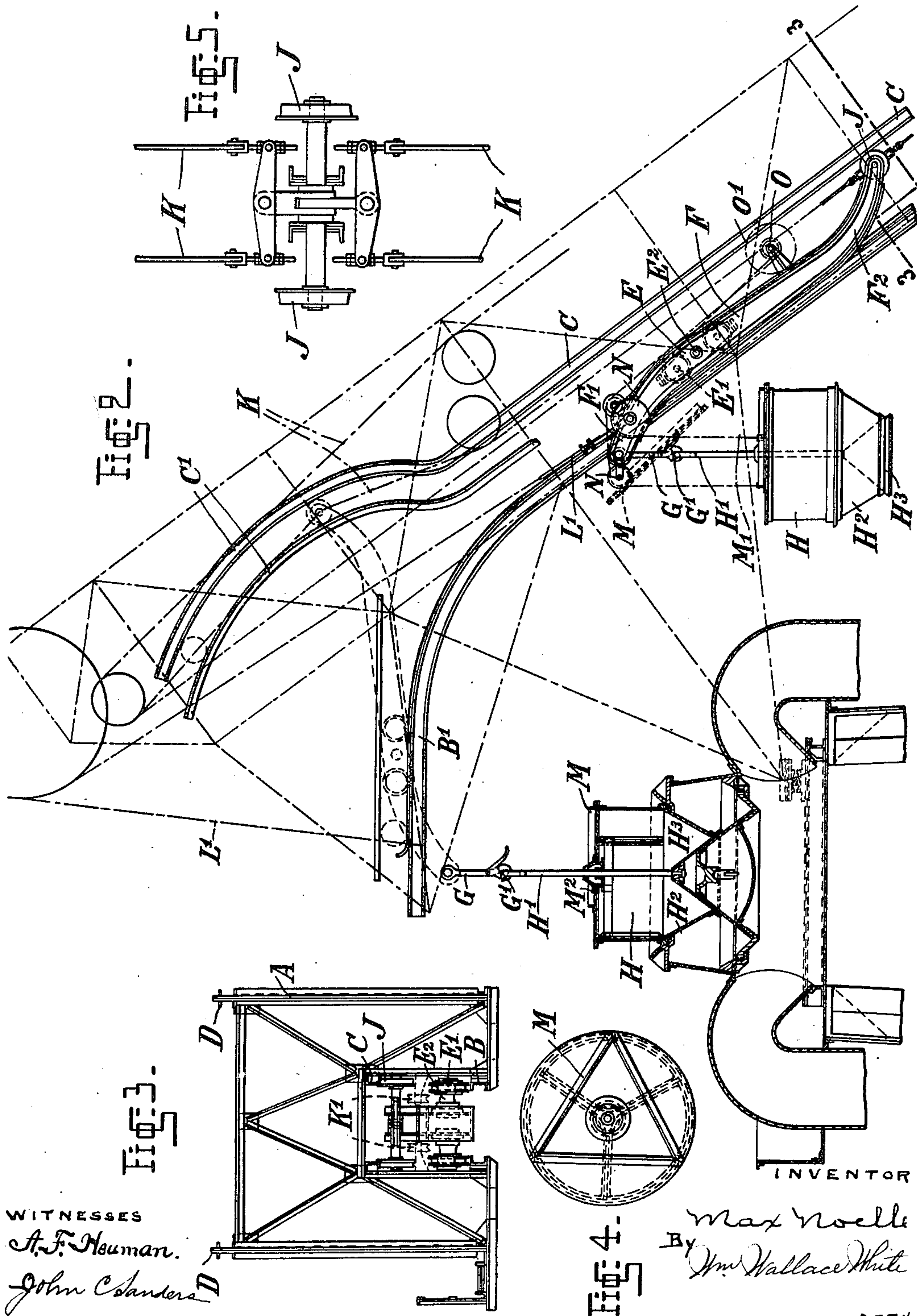
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FURNACE-CHARGING APPARATUS.

990,379.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, MAX NOELLE, a subject of the Emperor of Germany, and residing at Essendine Mansions, 82 Essendine road, London, W., England, have invented new and useful Improvements in Furnace-Charging Apparatus, of which the following is a specification.

This invention relates to improvements in furnace charging apparatus, the object being to lift the receptacle containing the load above the mouth of the furnace and to discharge the load automatically into the furnace.

The invention appertains to that class of furnace charging apparatus wherein a bucket carrying the load is suspended from a trolley the latter being propelled up an inclined track to convey the charge to the furnace mouth. In this class of machine it is usual to employ a balancing device which counterbalances the weight of the bucket when the latter is lowered vertically to the furnace mouth. In known apparatus of this class the trolley carrying the receptacle for the load and running on an inclined track is raised to a certain position, and there stopped whereupon the receptacle is lowered to the furnace mouth by a turning movement of some part of the trolley. A special balancing device independent of the trolley has to be used for raising and lowering the load receptacle at the furnace mouth. These known arrangements are subject to serious disadvantages.

A furnace charging apparatus according to this invention wherein an inclined track is employed that is curved at the top and provided with guide rails to effect the lowering of the charge to the furnace comprises the combination with a trolley arranged to run on the track rails of a rigid double-armed lever pivoted to the trolley, positively connected at its fore end with the receptacle containing the load and provided at the rear end with a roller engaging an upper guide rail, the tracks being so arranged relatively to each other that the double-armed lever is tilted to discharge the load during the final progressive movement of the trolley.

A further feature of this invention consists in the combination with the pivoted lever carrying the bucket of a balance weight having a rope passing over a pulley and connected to the lever in front of the

pivot so that when the trolley turns and becomes horizontal at the top the balance weight rope will have an increasing tendency to support the weight of the load whereby the tension of the hauling rope is not allowed to become excessive.

Two hauling ropes are preferably employed one connected to each side of the rear end of the double-armed lever; and fixed pairs of guide rollers support the hauling ropes and are so placed as to allow the trolley to pass between them.

According to this invention the load bucket is provided with a removable lid and chains connected to the lid pass over pulleys on the fore end of the supporting lever and are connected to a drum carrying a toothed wheel which on approaching the bottom of the framework engages a rack so as to raise the lid. It is desirable that the link supporting the bucket should be as short as possible to minimize swinging. For this reason the lid has a hole in the center large enough to pass over all parts of the link and hook thereon when the lid is raised and also the pulley and chain arrangement is such as to raise and tilt the lid quite close up to the framework. When the trolley is raised again the lid is automatically lowered on to the bucket.

In the accompanying drawings which illustrate one form of furnace charging apparatus embodying this invention:—Figure 1 is a side elevation of the whole apparatus as applied to a blast furnace which is shown in section; Fig. 2 is a similar view on a larger scale showing only the top of the apparatus; Fig. 3 is a transverse section on the line 3—3 of Fig. 2; Fig. 4 is a plan of the bucket; and Fig. 5 is a plan of the rear end of the double armed lever showing the attachment of the hauling ropes.

Like letters indicate like parts throughout the drawings.

The framework A of the girder form is mounted on suitable bearings A¹ on the ground and A² at the top of the blast furnace. The framework is provided with three sets of rails, track rails B for the trolley, guide rails C and the track rails D on the top for the counterbalance weight. The trolley E as shown in Figs. 2 and 3 has four wheels E¹ two on each side running on the track rails B and also has a transverse shaft E². Pivoted on the shaft E² is a long double armed lever F constituting the support for

the load bucket. For this purpose the fore end F^1 of the lever has a short link G with a hook G^1 thereon adapted to engage a loop on the supporting rod H^1 of the load bucket
 5 H which is of the well known type having a hopper H^2 and a conical bottom H^3 .

At the rear end F^2 of the double armed lever F are fixed two guide rollers J which engage the guide rails C . The weight at the
 10 fore end of the double armed lever keeps the guide rollers J pressing against the guide rails C . Two continuous hauling ropes K are connected to the rear end F^2 of the double armed lever one on each side. These
 15 ropes pass over guide pulleys K^1 which are separated sufficiently widely to allow the trolley to pass between them. The ropes also pass over the pulley K^2 at the top and over the drum K^3 of a reversible winch K^4
 20 which is controlled by the operator.

The bucket H containing the load is brought to the charging apparatus by special cars. By means of the hook G^1 it is suspended to the supporting lever and by the
 25 action of the hauling rope is taken to the top of the furnace.

At their upper ends the track rails B are turned to extend in a substantially horizontal plane. The guide rails C for the rear
 30 end of the double armed lever are curved in a special cam shape C^1 at the top the arrangement being such that during the last stages of the upward movement of the hauling rope, the trolley E shall gradually come
 35 to rest as it moves along the horizontal track B^1 while the rear end F^2 of the double armed lever is pulled upward between the cam rails C^1 so as to lower the bucket H vertically downward on to the top of the
 40 blast furnace. Further vertical downward movement of the link G causes the conical bottom of the bucket to push down the conical bell of the blast furnace and discharge the bucket in the well known way.
 45 The draw rods passing through the guides of the bucket to the bottom of same and the short rod G engaging therewith, which is forced downward, insure the lowering of the bottom of the bucket and prevent its
 50 being held fast during the emptying.

The balance weight L runs on rollers on the track D and is connected by a rope or chain L^1 to the fore end F^1 of the double
 55 armed lever. The result of this arrangement is that during the normal upward movement of the trolley the balance weight to a certain extent balances the weight of the bucket and load, and when the trolley turns and becomes horizontal at the top
 60 the balance weight rope L^1 has an increasing tendency to support the weight of the load whereby the tension on the hauling rope is not allowed to become excessive.

After emptying the bucket the operator
 65 reverses the machinery. First the bottom

H^3 of the bucket is lifted thereby allowing the bell to close, and raising the bucket, then the whole bucket is taken up, lifted clear above the furnace mouth and lowered through the same path by which it was raised. 70

To prevent the gases escaping during the time of discharging the bucket, the top of the bucket is closed by a lid M to which are connected chains M^1 passing over pulleys N
 75 on the fore end F^1 of the double armed lever and connected to a rotatable drum O supported on the lever F . The drum O is provided with a toothed wheel O^1 and when the trolley is approaching the end of its
 80 downward movement the toothed wheel engages a rack arranged parallel to the track so as to wind up the chains and raise the lid off the bucket. The hole M^2 in the lid is made large enough to pass over the hook G^1
 85 and the chain arrangement is such as to raise and tilt the lid close up to the framework A . By this means the bucket can be completely opened although the link G and supporting bar H are quite short. 90

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

1. In a furnace charging apparatus, in combination, a frame, a track supported
 95 thereon, a trolley running upon said track, a double armed lever pivotally supported on said trolley, means carried by said lever at its front end to support a receptacle adapted to contain a load, guiding means
 100 mounted upon said lever adjacent its rear end and a guide rail carried by said frame and with which said guiding means engages, said track and said guide rail being curved at their upper ends to cause said lever to tilt,
 105 whereby the receptacle will be lowered into position to discharge its load.

2. In furnace charging apparatus, in combination, a frame, a track supported thereon,
 110 a trolley running upon said track, a double armed lever pivotally supported upon said trolley, means carried by said lever at its front end to support a receptacle adapted to contain a load, a guide roller mounted upon said lever adjacent its rear end and a
 115 guide rail carried by said frame and with which said guide roller engages, said track and said guide rail being curved at their upper ends to cause said lever to tilt, whereby the receptacle will be lowered into position to discharge its load. 120

3. In furnace charging apparatus, in combination, an inclined frame, a track supported thereon, a trolley running upon said
 125 track, a double armed lever pivotally supported upon said trolley, means carried by said lever adjacent its front end to support a receptacle adapted to contain a load, a guide roller mounted upon said lever adjacent its rear end, and a guide rail carried 130

by said frame and with which said guide roller engages, said track being curved downwardly at its upper end, whereby said lever will be tilted to cause said receptacle to be moved into position to discharge its load.

4. In furnace charging apparatus, in combination, a track supported thereon, a trolley running upon said track, a double armed lever pivotally supported upon said trolley, means carried by said lever adjacent its front end to support a receptacle adapted to contain a load, a guide roller mounted upon said lever adjacent its rear end and a guide rail carried by said frame and with which said guide roller engages, said track being curved downwardly at its upper end and said guide rail being curved upwardly at its upper end, whereby said lever will be tilted as the trolley reaches the upper end of the frame to cause the receptacle to be moved into position to discharge its load.

5. In furnace charging apparatus, in combination, a frame, a track supported thereon, a trolley running upon said track, a double armed lever pivotally supported upon said trolley, means carried by said lever adjacent its front end to support a receptacle adapted to contain a load, means for tilting said lever when the trolley reaches the upper end of the frame, a hauling rope operatively connected to said trolley, a balance weight, a rope secured to said balance weight and to said lever at a point in front of its pivotal connection with the trolley, whereby said rope will have an increasing tendency to support the weight of the load and prevent the tension on the hauling rope from becoming excessive.

6. In furnace charging apparatus, in combination, a frame, a track supported thereon, a trolley running upon said track, a double armed lever pivotally supported upon said trolley, means carried by said lever adjacent its front end to support a receptacle adapted to contain a load, means for tilting said lever when the trolley reaches the end of the frame, a hauling rope operatively connected to said trolley, a balance weight, a track upon said frame with which said weight engages, a pulley upon the upper end of the frame and a rope secured to said balance weight passing over said pulley and secured to said lever at a point in front of its pivotal connection with the trolley.

7. In furnace charging apparatus, in combination, a track supported thereon, a trolley running upon said track, a double armed lever pivotally supported upon said trolley, means carried by said lever adjacent its front end to support a receptacle containing a load, hauling ropes secured to the rear end of said lever at each side thereof and pairs of guide rollers mounted upon said frame and with which said hauling ropes engage,

the guide rollers of each pair being spaced from one another sufficiently to permit the trolley to pass therebetween.

8. In furnace charging apparatus, in combination, a track supported thereon, a trolley running upon said track, means operatively associated with said trolley to support a receptacle adapted to contain a load, a cover for said receptacle operatively connected to said trolley and automatically operated means for lifting said cover from said receptacle as the trolley approaches one end of said frame.

9. In furnace charging apparatus, in combination, a frame, a track supported thereon, a trolley running upon said track, means operatively associated with said trolley to support a receptacle adapted to contain a load, a cover for said receptacle, chains operatively associated with said trolley and connected to said cover, a drum operatively associated with said trolley and to which said chains are connected, and means for rotating said drum to actuate said chains to lift said cover from the receptacle.

10. In furnace charging apparatus, in combination, a frame, a track supported thereon, a trolley running upon said track, means operatively associated with said trolley to support a receptacle adapted to contain a load, a cover for said receptacle, chains operatively associated with said trolley and connected to said cover, a drum operatively associated with said trolley and to which said chains are connected, a toothed wheel associated with said drum and a rack positioned upon said frame and adapted to engage said toothed wheel to rotate the same, whereby said chains will be actuated to lift said cover from the receptacle.

11. In furnace charging apparatus, in combination, a frame, a track supported thereon, a trolley running upon said track, a double armed lever pivotally mounted upon said trolley, means adjacent the front end of said lever to support a receptacle adapted to contain a load, a drum mounted upon said lever, a toothed wheel operatively connected with said drum, pulleys positioned upon said lever adjacent the front end thereof, a cover for said receptacle, chains secured to said drum and passing over said pulleys and secured to said cover and a rack mounted upon said frame adapted to engage said toothed wheel to rotate the same, whereby said chains will be actuated to lift said cover from the receptacle as the trolley reaches the portion of the frame at which said rack is positioned.

12. In furnace charging apparatus, in combination, a frame, a track supported thereon, a trolley running upon said track, a double arm lever pivotally mounted upon said trolley, means adjacent one end of said lever for supporting a receptacle adapted to

contain a load, a cover for said receptacle
suspended from said end of said lever and
automatically operated means for lifting
said cover from said receptacle and holding
5 it in an inclined position whereby the length
of the suspending member between the cover
and the lever may be comparatively short.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

MAX NOELLE.

Witnesses:

R. WILSON,

R. F. WILLIAMS.