In [31]:
```
#Importing Libraries and Load Data

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.preprocessing import LabelEncoder
import joblib
```

In [33]:
```
# Define the path to the Excel file
file_path = r"C:\Churn Data Analysis\Data\Prediction Data.xlsx"

# Define the sheet name to read data from
sheet_name = 'vw_ChurnData'

# Read the data from the specified sheet into a pandas DataFrame
data = pd.read_excel(file_path, sheet_name=sheet_name)

 # Display the first few rows of the fetched data
data.head()
```

Out[33]:

	Customer_ID	Gender	Age	Married	State	Number_of_Referrals	Tenure_in_Months	Value_D
0	11098-MAD	Female	30	Yes	Madhya Pradesh	0	31	Dea
1	11114-PUN	Male	51	No	Punjab	5	9	Dea
2	11167-WES	Female	43	Yes	West Bengal	3	28	Dea
3	11179-MAH	Male	35	No	Maharashtra	10	12	N
4	11180-TAM	Male	75	Yes	Tamil Nadu	12	27	Dea

5 rows × 32 columns

In [34]:
```
# Data Preprocessing

# Dropping columns that won't be used for prediction
data = data.drop(['Customer_ID', 'Churn_Category', 'Churn_Reason'], axis=1)

# List of columns to be label encoded
columns_to_encode = [
    'Gender', 'Married', 'State', 'Value_Deal', 'Phone_Service', 'Multiple_Lines',
    'Internet_Service', 'Internet_Type', 'Online_Security', 'Online_Backup',
    'Device_Protection_Plan', 'Premium_Support', 'Streaming_TV', 'Streaming_Movies',
    'Streaming_Music', 'Unlimited_Data', 'Contract', 'Paperless_Billing',
    'Payment_Method'
]

# Encoding categorical variables except the target variable
label_encoders = {}
```

```
for column in columns_to_encode:
    label_encoders[column] = LabelEncoder()
    data[column] = label_encoders[column].fit_transform(data[column])

 # Encoding the target variable 'Customer_Status'
data['Customer_Status'] = data['Customer_Status'].map({'Stayed': 0, 'Churned': 1})
```

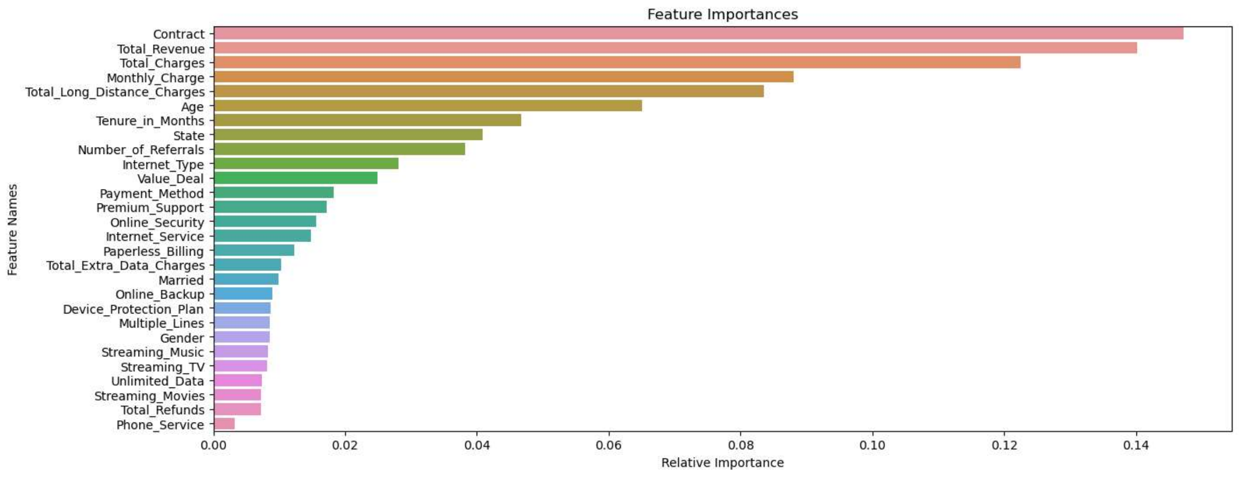
In [35]:

```
# Split data into features and target
X = data.drop('Customer_Status', axis=1)
y = data['Customer_Status']

# Split data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=
```

In [36]:

```
# Initialize the Random Forest Classifier
rf_model = RandomForestClassifier(n_estimators=100, random_state=42)

# Train the model
rf_model.fit(X_train, y_train)

# Make predictions
y_pred = rf_model.predict(X_test)


# Evaluate the model
print("Confusion Matrix:")
print(confusion_matrix(y_test, y_pred))
print("\nClassification Report:")
print(classification_report(y_test, y_pred))


# Feature Selection using Feature Importance
importances = rf_model.feature_importances_
indices = np.argsort(importances)[::-1]

# Plot the feature importances
plt.figure(figsize=(15, 6))
sns.barplot(x=importances[indices], y=X.columns[indices])
plt.title('Feature Importances')
plt.xlabel('Relative Importance')
plt.ylabel('Feature Names')
plt.show()
```

```
Confusion Matrix:
[[783  64]
 [126 229]]

Classification Report:
              precision    recall  f1-score   support

           0       0.86      0.92      0.89       847
           1       0.78      0.65      0.71       355

    accuracy                           0.84      1202
   macro avg       0.82      0.78      0.80      1202
weighted avg       0.84      0.84      0.84      1202
```



Use Model on New Data

In [38]:
```
# Path to the Joiner Data
file_path = r"C:\Churn Data Analysis\Data\Prediction Data.xlsx"
sheet_name = 'vw_JoinedData'
new_data = pd.read_excel(file_path, sheet_name=sheet_name)
print(new_data.head())

# Retain the original Data
original_data = new_data.copy()
customer_ids = new_data['Customer_ID']

# Data Preprocessing
new_data = new_data.drop(['Customer_ID', 'Customer_Status', 'Churn_Category', 'Churn_R

# Encoding
for column in new_data.select_dtypes(include=['object']).columns:
    new_data[column] = label_encoders[column].transform(new_data[column])

# Making predictions
new_predictions = rf_model.predict(new_data)

# Adding predictions to the original DataFrame
original_data['Customer_Status_Predicted'] = new_predictions

 # Filter the DataFrame to include only records predicted as "Churned"
original_data = original_data[original_data['Customer_Status_Predicted'] == 1]

 # Save the results
original_data.to_csv(r"C:\Churn Data Analysis\Data\Predictions.csv", index=False)
```

```
  Customer_ID  Gender  Age Married        State  Number_of_Referrals  \
0   11751-TAM  Female   18      No   Tamil Nadu                    5   
1   12056-WES    Male   27      No  West Bengal                    2   
2   12136-RAJ  Female   25     Yes    Rajasthan                    2   
3   12257-ASS  Female   39      No        Assam                    9   
4   12340-DEL  Female   51     Yes        Delhi                    0   

   Tenure_in_Months Value_Deal Phone_Service Multiple_Lines  ...  \
0                 7     Deal 5            No             No  ...   
1                20        NaN           Yes             No  ...   
2                35        NaN           Yes             No  ...   
3                 1        NaN           Yes             No  ...   
4                10        NaN           Yes             No  ...   

    Payment_Method Monthly_Charge Total_Charges Total_Refunds  \
0     Mailed Check      24.299999     38.450001           0.0   
1  Bank Withdrawal      90.400002    268.450012           0.0   
2  Bank Withdrawal      19.900000     19.900000           0.0   
3      Credit Card      19.549999     19.549999           0.0   
4      Credit Card      62.799999     62.799999           0.0   

  Total_Extra_Data_Charges Total_Long_Distance_Charges Total_Revenue  \
0                        0                    0.000000     38.450001   
1                        0                   94.440002    362.890015   
2                        0                   11.830000     31.730000   
3                        0                   10.200000     29.750000   
4                        0                   42.189999    104.989998   

  Customer_Status Churn_Category Churn_Reason  
0          Joined         Others       Others  
1          Joined         Others       Others  
2          Joined         Others       Others  
3          Joined         Others       Others  
4          Joined         Others       Others  

[5 rows x 32 columns]
```

```
In [ ]:
```